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July 9, 1985

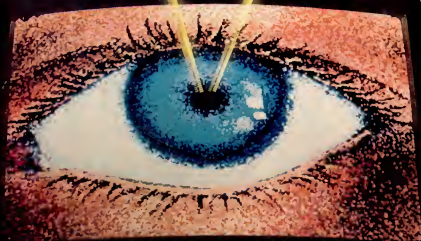
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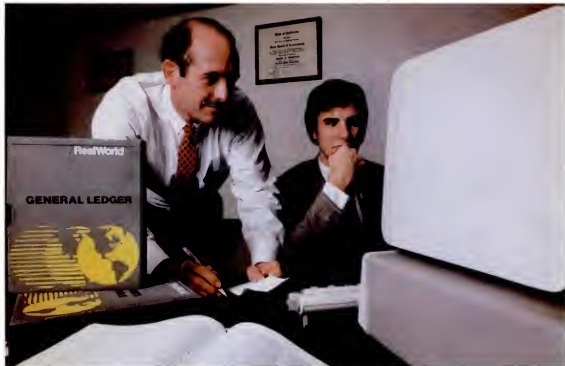
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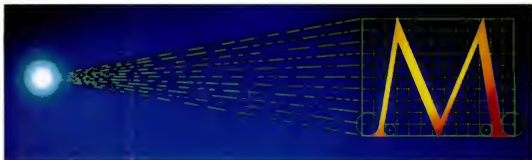
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# What's Inside

The mention of optical character readers at this issue's planning meeting started gears grinding to come up with an appropriate cover image—till a certain anonymous voice intervened.

It was a dark and stormy night. (Actually, it was about 9:50 a.m. and slightly cloudy, but who am I to buck literary tradition?) The conference table was cluttered with a mass of unidentifiable papers, memory boards, and a paperweight of mysterious proportions; the monitor of the AT in the corner glowed like some lonely beacon. Editor Bill Machrone sat at his desk and stared dolefully at the schedule on the screen; especially at the sentence that read, in screaming red pixels, "10 a.m. Art-Edit meeting."

For the uninitiated, Art-Edit meetings are the forums at which the staff of *PC* gathers to discuss the feature stories of a particular issue. From the editorial side, the usual complement of attendees includes Machrone, managing editor Barry Owen, assistant managing editors Luisa Simone and Gus Venditto, and a smattering of associate editors. To cover the art angle, design director Peter Blank and art directors Mary Zisk and Gerard Kunkel are usually present.

On this particular morning, Venditto was the first person to appear, carrying a white cardboard box filled with somewhat soggy jelly doughnuts. "It was all that was left," he said sheepishly as Machrone cleared a space in the rubble on the table.

Venditto had a more intimate involvement in this particular meeting, since the topic for discussion was issue 14—"his" issue.

Consequently, he was also laboring under an armful of schedules that had been hidden under the box of doughnuts



and that he now threw on top of a disassembled CPU.

By this time, the other members of the staff had reluctantly wandered in, most of them carrying yellow pads, pens, and half-filled coffee cups. (There is a rumor going around that the staff of *PC*, having been constantly exposed to word processing software, has forgotten what a pen is for. This is not true. But we sometimes do have a problem with erasers.)

## Brainstorming

There was the usual pertinent conversation that always takes place before such meetings, taking in topics like the need for a new filter in the water cooler and Owen's taste in sweaters. Finally, Machrone cleared his throat authoritatively and, in the brief silence, asked, "Could we get down to it, please? What

issue are we talking about?"

"Issue 14," said Venditto, passing out his schedules. The assembled company wiped the jelly off the schedules as they got them and turned toward associate editor Lisa Kleinman.

"The cover story," she began, "concerns optical character readers. These machines use optical character recognition technology to scan pages of text, digitize them, and send them to a computer in ASCII format."

The editors in the group perked up. Many feel it's easier to rework a badly written article on a computer screen than on paper using scissors and tape. Unfortunately, even on a computer magazine, not all manuscripts come in in electronic form. The appearance of a typed, single-spaced manuscript on somebody's desk usually results in a lot of growling and a run on the department's cookie supply (editors tend to eat when they get frustrated).

Kleinman continued, "We've assigned five articles to this topic. Tom Stanton is writing the introduction and a review of the Kurzweil Reader. He has also teamed up with technical editor Craig Stark for a rundown on mid-range readers."

"Oh!" remarked Simone. "So that's why all those machines were crowded into Craig's office. I thought we had run out of space in the Toy Shop."

"Winn Rosch has reviewed the Oberon Omni-Reader," Kleinman finished up, "and finally, Steve Rosenthal has given us an overview of scanners."

"That sounds like a pretty solid pack-

## WHAT'S INSIDE

age to me," commented Peter Blank. "Now, what kind of cover concept were you thinking of?"

There was dead silence from the editorial side. "We were kind of hoping that

you would have some sort of idea," Venditto finally said.

Suddenly, associate editor Barbara Krasnoff poked her head into the office. "Sorry to disturb you," she said. "But

my hard disk is doing something extremely weird, and Mike O'Cone is busy reassembling a printer. Could I borrow Bill for a moment?"

Machrone was up in a moment (he handles the office computers with the enthusiasm of a true techie), but Owen immediately blocked his way. "No way," he announced sternly. "You're not leaving this room till we settle this."

Helpless in the face of united opposition, Machrone sat down. "Sorry, Bill. I tried," grinned Krasnoff and disappeared, to the hoots of the rest of the staff.

### What about the Cover?

"Well," Owen said. "Now that that's settled, what do we do about the cover?"

The art people sighed and exchanged glances. "We'll come up with some ideas and get back to you on it tomorrow," Zisk said. "Now, what else is in the issue?"

"I see we're doing an update on last year's database series," Machrone noted approvingly, and Kleinman nodded. "We've given it to Alfred Poor as a special report. We got so much positive reader feedback on that project, and so many new programs have come out recently, that we decided to update it."

Jared Taylor has uncovered some interesting tips for this issue's Spreadsheet Clinic," Kleinman continued. "Lotus users can learn how to add color to their displays and use special graphic characters."

"We also have a new column," Machrone announced. "It's called Power User, and it's going to give tips and advice for the more advanced users."

There were murmurs of approval around the room. Machrone glanced at the white doughnut box (which was, predictably, empty) and asked, "Is there anything else before we break?"

"I have a question," came a petulant call from the doorway. "Why can't I tell the readers who writes What's Inside?"

"Because you're supposed to be an anonymous editorial voice," answered Machrone sternly. "Is that all? Okay, people, thanks a lot."

"Oh, well," murmured the Anonymous Voice. "At least I tried."



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GEM DESKTOP software looks like an ordinary floppy for your PC. But slide it into your IBM's disk drive, and the change begins. From this moment on, you can run most of the important PC programs—but instead of typing cryptic commands to get into your program menu, you simply point and click your mouse\* or use your cursor keys to open a window. It's like a breath of fresh air compared to the complex PC DOS operating system you've been using.

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Simple menu headers at the top to guide you effortlessly from one function to the next. So instead of making more complex keystrokes that can easily be mistyped, your IBM PC is easier and faster to use than ever before. There is also a clock and a calculator both built right in.

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PCM-7/9

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128K memory, one 1/4 DSDD floppy disk, 132 column printer, 80X24 CRT, MS-DOS, PC DOS 2.0 or later.

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# IF YOU PROGRAM IN 'C', PC BRA Our Craftsman™ Line Has New Products,

## C-SPRITE Lattice's Own Symbolic Debugger for Lattice® C

This versatile companion to your C compiler gives you the best of both worlds for an out of this world price. Hand it a COM or EXE file produced by the Lattice compiler (using the -d option) and C-Sprite™ will speak your language: your function names, your variable names, your data types, and the line numbers from your source code. At the same time you can get a close-up view of machine addresses and machine-code instructions, if you want to scrutinize just what machinations the compiler (or an assembler) contrived.

This already knows how to converse with C-Sprite. If you are familiar with Microsoft's Debug, Lattice began with that well-known command language, and added to it considerably. You can work with data in hex, as you might expect, but you can also differentiate between Cx data types to cause the debugger to treat addresses as strings, long integers, etc., even pointers, both in display and entry.

C-Sprite can set breakpoints using symbolic or addresses. You can submit chains of commands to be executed at the breakpoints, or set commands that execute until a condition is met.

C-Sprite even has macros—use your source code variable names in a macro to dump the contents of entire C structures, for example. And you can debug through one of the COM ports with a second terminal so as not to disturb your program's display screen. What's more, if you link with Hlink68k, C-Sprite can even handle overlays.

Program details will find plenty of implements to rummage through in this kitbag.

Product Code: L2300  
List Price: \$175  
Our Price: \$159

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## dBBC Switch from dBASE's Language to C for Power, Speed

There are a lot of dBASE™ file users out there. Most of them don't just keep data bases and use dBASE's limited reporting facilities. They're not programmers, so they don't use C programming language. But they'd like more for their efforts, and that's a business opportunity.

dBBC™ links C to dBASE. It is a function library that creates files which exactly replace dBASE file design. So dBASE can read and update them. And the reverse, dBC can use any file created by dBASE. Now C and dBASE can operate on the same data bases interchangeably.

That opens up the widespread culture of dBASE installations to exploitation by C programmers. Now you can replace the resident

Two Versions: Product Code: List Price: Our Price:  
Dbase II Compatible: L2001 \$250 \$225  
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## TEXT TOOLBOX™ #1 These Utilities Work Wonders of Organization

Welcome to "grep," "tr," "ed" and "diff." Tools you will reach for as routinely as "copy" once you come to know them. Unix™ boasts a number of marvelous utilities that are missing to the PC world. Lattice has assembled a cluster of the most useful text management tools into a single package.

"Grep" looks for text patterns in any number of files. Want all occurrences of a global variable throughout a program system? Want to search all programs in a directory, down paths to other directories, or all files on a disk? Need to find all the function calls in an entire program system? Grep can do it with a powerful expression syntax that goes far beyond your text editor's search command, because you can tell it to search all "r" files for all lines with "t" and "f", no matter how many characters lie between the parentheses. It then searches it will match any character in whatever character range you cite, in a single character position or anywhere in a string, as you specify. Or "Grep" will match patterns only at the beginnings or endings of lines, and can differentiate between embedded and isolated strings. "Grep" is a real gem.

"WC" counts lines, words, and characters in a file, and has a checkbox independent of machine character sets so you can test whether a file has successfully been transferred between computers. "Ed" is similar to the well-known Unix editor. It offers search and replace with "Grep" syntax, block move, read and write, optional line numbering, append, insert, delete, and the usual library of you can instruct "Ed" to apply a file of commands to any number of target files, even complicated chains of text additions, such as those created by "Diff".

"Diff" You've probably tried to write one (and then discovered how tangled the logic was). "Diff" compares text files line for line and reports differences. It's much more sophisticated than "Bleem", if your MS™ DOS has that. It can optionally ignore "white space" differences (blanks, tabs). It uses complex algorithms to re-synchronize between files after disparities of any number of lines are found. And its output is a precise list of instructions telling what to do to make two files the same, a list which you can hand to "Ed" to do the job.

"Tr" converts text files line for line and reports differences. It's much more sophisticated than "Bleem", if your MS™ DOS has that. It can optionally ignore "white space" differences (blanks, tabs). It uses complex algorithms to re-synchronize between files after disparities of any number of lines are found. And its output is a precise list of instructions telling what to do to make two files the same, a list which you can hand to "Ed" to do the job.

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You'll obviously find such assistance indispensable. Like having a librarian to sort out the confusion every day and keep your work tidy.

Product Code: L1200  
List Price: \$120  
Our Price: \$105

## CURSES A Screen Management Interface to Swear By

Curses is a Lattice creation which manages the screen of the IBM PC in the same fashion as the curses utility of Unix and similar operating systems. It is to adapt programs which call Unix's curses functions for screen management, and need the equivalent library when moved to the PC for re-compilation. Or use it when creating software on the PC to assure that it is Unix compatible.

Curses is a library of eighty-four functions and macros which can keep any number of screen images in memory. A screen may be full or partial size, and any can be summoned to the physical screen at your program's command.

Within a screen, Curses employs a vast function set to get characters, wrap lines, scroll, blank lines, highlight—virtually any tool needed to update the screen. The product supports color, and all four memory models. Its input functions give you control over whether to echo each character to a memory screen. In keeping with the terminal orientation of Unix curses, the physical screen is re-painted (at high speed) only when your program calls a refresh function.

Writing screen management code leads to unappealing muds and expositions. Swear off! Let Curses clean up your language.

Product Code: L0800  
List Price: \$125  
Our Price: \$110

## C CROSS COMPILERS Portability to 16-Bit With Cross Compilers From Lattice

PC BRAIND now carries an assortment of cross compilers to move products from larger host machines to the PC-DOS or MS-DOS environment.

Cross compilers are now available for these hosts: VAX/VMS™, VAX/VMS, MC68000/UNIX, Altera 386, Hewlett Packard-UX.

Cash in on products already developed on your bigger machines by rapid transfer to the burgeoning world of PC owners. Or take advantage of big machine science and utilities for your development work for the PC market, and only then download the results. A quick mental calculation will convince you that productivity gains will quickly pay off costs.

## Expand Your Sales to the CP/M World

They have vanished from the headlines, but there are over a million CP/M™ machines still humming across the land. Yet Intel reports that "there's no new CP/M software." If you are part of the problem, here's a money-making way to become part of the solution. Convert your MS-DOS/PC-DOS products with our CP/M-30/TC-DOS cross compiler. For a few dollars, you'll double your market in a hurry.

## CODE SIFTER Find the Fast Track for Your Program

You know it runs, but how fast? If it can't win, better not enter it in today's horse race. Don't let it out of the stable until you've put it through its paces with this perfectly priced stopwatch.

Code Sifter finds the sluggish spots in your program. On its own, it will divide a COM or EXE file of any size into thirty-two equal partitions. Alternatively, you can specify the partition boundaries with addresses, or with symbols if your linker has produced a symbol map. Then tell Sifter to run your program. It samples your object file at precisely timed intervals and counts how many times it finds the instruction pointer in each partition. Job done, it reports the number and percentage of hits in each partition.

You are in for some surprises when you discover just how unbalanced the activity is likely to be, and thus why Code Sifter is so valuable. It profiles just where you are spending time optimizing your code, or even converting to assembler subroutines.

Code Sifter has a number of monitoring options. You can tell it to include any combination of your program, DOS, and BIOS in its analysis. You can specify the sampling rate. You can tell Code Sifter the number of times to run a program, and between each run discard the less active ranges, and re-partition the hot spots, so that you zoom in ever tighter on small areas of code. Right down to the last byte! Try it on the sample program that comes with the Code Sifter.

Code Sifter will give you the man's edge.  
Product Code: N3100  
List Price: \$119  
Our Price: \$99

## CVUE A Text Editor to Make Your Own

CVUE is a text screen oriented text editor which does most of the things that a good editor should do, such as automatic scrolling vertically and horizontally, insertion and over-type entry modes, block delete, undelete and move, and full DOS 2.0 directory path name support in reading and writing files.

It is easy to learn with a comprehensive command menu screen which makes the documentation an ornament. It was written by the Lattice programmers who felt forgotten by the folk who write WP software. They needed easy entry of non-display characters such as control codes and escape sequences, yet footnotes, indenting and understanding of block structures looked larger than italic printing for them. Pattern searching was out over spelling checking. So CVUE was born.

CVUE has its limitations. It only supports in-memory text files, but with memory at today's prices, creating and maintaining five 500 Kbytes long is practical. Any other, modular source code of structured programs never gets nearly that big. As compensation, CVUE is very compact and fast. Even in 84K computers it has no need for indolently slow overlays to perform its full function repertoire.

The power of CVUE is in ease of customization. Even the binary version offers full customization of the keyboard editing commands. And when you take advantage of the Source Code option on the next page, the resident editor can be made truly your own.

Product Code: L2540  
List Price: \$100  
Our Price: \$90

# ND™ SPEAKS YOUR LANGUAGE

## Reduced Prices & Plenty of Source Code

### C-TREE

B-Tree File Manager, Source Code, No Royalties! **NEW!**

A b-tree can be indexed with bigns, no random looking or ask its age. In a stand of saplings, that one is a real cooey. C-tree has been around since 1979. That means reasoned, sturdy code which hasn't cracked under the weight of prolonged and widespread use.

### LMK

**Unk-like "Make" Makes Light of System Building in Any Language**

If you have ever built a complex system, you know the time loss and tedium of recompiling, rebuilding libraries and relinking modules because a snippet or two of code has changed. You need no answer. You need batches of them to avoid redoing everything again and again.

Instead, imagine making a change deep in a system, and simply telling LMK to "take over, and simply linking LMK to the system, to take over. No further thinking or keypunching. LMK will rebuild your final product, however involved and complex, by doing just what is needed and no more.

How? You write a command file which expresses, bottom to top, all the elements comprising your system and all its dependencies. LMK will rebuild your final product, however involved and complex, by doing just what is needed and no more. You write a command file which expresses, bottom to top, all the elements comprising your system and all its dependencies. LMK will rebuild your final product, however involved and complex, by doing just what is needed and no more. You write a command file which expresses, bottom to top, all the elements comprising your system and all its dependencies. LMK will rebuild your final product, however involved and complex, by doing just what is needed and no more.

The command file uses a simple, readable syntax: "prog.obj prog.\$DIRVS", for example, says what source file this object file depends on, and says to link your previously-defined macro DIRVS into the expression, which in this case might be a list of files with hardware drivers, or an another case your preferred set of compiler options.

LMK does not care what programming language you use; it's not just for C. For that matter, LMK can apply to more than programming. It can be used for any set of tasks which can be accomplished through commands issued to the operating system. Try it for repeated reassembly of lengthy documentation, or for selective reorganization of spreadsheets so that only the dependents of altered supporting schedules get re-calculated.

Whenever your imagination leads you, LMK will find the shortest path to get the job done. Minimum time, minimum effort, software.

Product Code:	List Price:	Our Price:
L2100	\$195	\$175

Its developer has added two very unusual features. C-tree now comes in C-source code, revealing all you've ever wanted to know about how b-trees are written. Second, provided you hand it into your binary application, you can redistribute C-tree without royalties.

Thanks to source code which does not derive from the K&M standard, C-tree can travel. Binary has always meant finding a substitute file manager when you port your work to another computer, operating system, or computer, then changing all the function calls and testing away. That's over. Tests in many environments prove that C-tree gives your application a ticket to anywhere.

C-tree permits any number of keys for a data file, supports duplicate keys, alphanumeric or numeric, etc. It's a big product with everything you need. Beyond that it is intelligently designed as both a high level set of C&M routines to minimize your coding by handling all details of adding a record on a key, for example, and as low level operations which you can access directly. Either way C-tree maintains optimal index structures which will find a record amongst a million ten byte keys in no more than five disk seeks.

And if all this is disappointing, now the good part. C-tree's design splits duties to allow any number of users to access an index file simultaneously even when updates are in progress so that editing and processing can take place in networks as possible. You must write the record-linking routines, as they are compiler and operating system dependent, but the documentation shows how by example.

Product Code:	List Price:	Our Price:
P0600	\$395	\$345

## USED COMPILERS

### WELCOME

**Trade In for the Latest Model Lattice C**

Has your compiler run out of gas? Has your model been discontinued? Is it falling behind for lack of new parts?

Even if yours is in good shape, you have surely noticed there are more options and accessories produced to run with the Lattice C compiler than any other. Don't do without these additions any longer. Let time for new Lattice plates. Trade in your original disks and manual of any of the compilers below and we'll send you Lattice's most up-to-date model, the fall here 2.15 (as press time).

From then on you will be adopted by Lattice for full, direct support by their technical support.

Microsoft MS-DOS/PC-DOS-C	\$150
Computer Innovations CO, Wizard C,	
Marx Attex C60, Mark Williams C,	
Digital Research C, Whitesmith's C	\$200

### PRE-C

Thorough "Lint"-like Analysis Now on the PC **NEW!**

It seems here long suited if we had a "lint" to give programs a thorough checking before they disappear into a compiler. The answer now is "yes".

Pre-C finds problems your compiler won't. Problems that a debugger will have trouble

figuring out. Even problems which will cause trouble with other compilers.

Pre-C finds all the syntactical tripwires that will blow out a compiler, sure, but it goes after subtler problems: code which will never be executed, casts with suspect conventions, variables declared as external but never used, functions never called, obsolete usage (even the C language has changed), machine-dependent expressions which will inhibit portability.

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Pre-C uses the Unix System III compiler standard to safeguard maximum portability anywhere in the C world. There are then plentiful command line options to advise Pre-C what to flag and what to ignore, useful during early coding when some functions are simply or incomplete. The resulting analysis can be filed for use with subsequent Pre-C runs, so work is not performed redundantly.

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## Free XT Software Jars Industry

IBM's giveaway program is viewed by many as no bundle of joy for competitors and vendors.

BY CHARLES BERMANT

BOCA RATON, Fla.—IBM is offering a basket of goodies for PC-XT buyers, but some folks in the computer industry are wary of the Big Blue Wolf's intentions.

Questions of antitrust violations have tainted this IBM software giveaway. Although the company claims the offer is only a 90-day promotion, some competitors and industry insiders wonder if it is actually an early move by Big Blue to further dominate the market.

The promotion itself seems relatively simple: Anyone who purchases an XT with a hard

disk can receive free copies of IBM's *DisplayWrite3* and either *TopView* or *Data Edition*. *DisplayWrite3* lists for \$349, *TopView* lists for \$149, and *Data Edition* for \$250; thus the promotion provides a potential software bonus of \$599—all told, a 13.3 percent savings over purchasing the machine and the programs at nonpromotional prices.

### Limited Offer

For purchasers of IBM's recently announced floppy-based XT (sans hard disk), an additional promotional bonus of *Writing Assistant* and *Planning Assistant* is offered. Each of



### FREE BONUS SOFTWARE

Floppy Disk Packages	Price
Writing Assistant	\$149
Planning Assistant	\$149
TOTAL	\$298
Planning Assistant	\$149
Display/Write 1	\$ 95
TOTAL	\$244
Planning Assistant	\$149
Writing Assistant	\$149
TOTAL	\$298

Available XT models	Price
XT Floppy Disk w/1 Drive	\$2,270
XT Floppy Disk w/2 Drives	\$2,570
XT Hard Disk w/128K	\$3,775
XT Hard Disk w/256K	\$3,895

Hard Disk Packages	Price
Display/Write	\$349
TopView	\$149
TOTAL	\$498
Display/Write	\$349
Data Edition	\$250
TOTAL	\$599

these programs lists for \$149.

In addition, National Accounts Division (NAD) and National Marketing Division (NMD), two of IBM's national sales channels, can offer their

customers the option of substituting the \$95 *DisplayWrite1* for the *Writing Assistant*.

In an apparent response to the antitrust allegations, IBM

(continued on next page)

## Columbia Data Systems Files for Chapter 11

COLUMBIA, Md.—Columbia Data Systems, a manufacturer of PC-compatible computers, has filed for Chapter 11 reorganization under the U.S. Bankruptcy Code.

Filing became necessary after

a disagreement arose between two banks to which the company owes money. First Pennsylvania Bank and the National Bank of Washington became embroiled in a battle for repayment of Columbia's debts. Ac-

cording to one employee, the company was "forced into" filing when it began showing a profit and the dispute between the banks could not be resolved.

"We now have the court's authority to continue," says Columbia president Robert Cross. "There has been very little fall off in customer support. The only unresolved issue is the dispute between the two banks.

Now, it is business as usual."

Cross says he expects the reorganization proceedings to be "neat, clean, and short" and that everything will be back to normal "in several months."

The action was taken May 4, a few days before the Spring COMDEX show in Atlanta. The company's booth there was vacant several times during the show.

—By Charles Bermant



## Free XT Software (continued from preceding page)

spokesperson, Rob Wilson, said it would be "illegal" for the promotion to continue indefinitely.

IBM officials point out that the promotion is optional. "We are giving dealers latitude if they choose to develop unique promotional campaigns," said company spokesperson John Q. Pope.

### Big Blue Meanies

"My seat-of-the-pants reaction is that IBM doesn't have the market share of PCs that would lead to a plausible charge of antitrust," says Jack Pearce, a Washington, D.C. attorney. "My impression is that such a charge wouldn't stick."

"In today's environment, there is nothing illegal that IBM could do," says one Washington-based industry source who asked not to be identified. "There is no company with the legal resources to challenge them, and this administration has shown no inclination to take such action."

Bundling, either on a temporary or permanent basis, is nothing new to the PC industry. The IBM move, however, caught many vendors by surprise. Microsoft spokesman Marty Taucher says, "Conceptually, we disagree with the idea of bundling. We see it as a short term promotion to sell more hardware."

"IBM has proven that they don't want to be a good neighbor," says Dave Winer, president of Living Videotext of Mountain View, Calif.

"To them, it's a short term promotion," says Pete Peterson, executive vice-president of Satellite Software in Orem, Utah. "But it will have an effect on other software companies. They're pushing two products that they've been having trouble moving. There is an undercurrent that IBM will go to any lengths to make its products succeed."

Peterson says that IBM "confuses" small software companies by cooperating in some areas and then making drastic moves that have potentially damaging results.

"It's as if they were an elephant, and we're hanging on by

a leg hair," he says. "If they trip, we're crushed." Another industry source also likened IBM to a pachyderm, stating that the move was "no different than what has been done by smaller companies. But when an elephant follows an industry trend, it tends to be devastating; when a mouse does it, nobody notices."

"I hope it is not a predatory move," says Camilo Ulm of

Lifetree Software in Monterey, Calif. "The sheer scope of this promotion means that 50,000 units will be given away for free. This is a significant chunk."

Wilson, who called *DisplayWrite* "a clunker," was disputed by Multimate International president Wilton Jones, who said that the 50,000 unit figure was not an accurate translation of possible lost sales.

"50,000 sales won't be lost," says Jones. "There will be no real impact on us. Large

corporations already using our program won't retrain employees just because they got a free copy of *DisplayWrite*."

If Jones, a well-known major software manufacturer, didn't feel threatened by the IBM promotional move, some hardware and peripheral vendors were downright gleeful. "I think it will be exciting for the market," says John Hahn of Alphacom in Campbell, Calif. "This will generate a lot of new store traffic."

# COMDEX: Nothing New Under the Georgia Sun

## OPINION

BY WILLIAM STEELE

ATLANTA—Spring COMDEX was a perfect match: a dull show in an even-duller city. Atlanta is the ultimate big small-town, where the central streets are deserted at 9 a.m. in the morning except for rabid conventioners bedecked with ribbons, inscrutable lapel pins, and plastic ID badges.

Gertrude Stein would have found less "there" there than in Oakland.

At the end of each April, right after tax time, the city lures 50,000 of the computer industry's richest nabobs in a potlatch of massive proportions. Market-weary attendees prowling the miles of aisles by day and the pricey hospitality suites by night, gulping down huge salvos of rubbery prawns and hoping to hear

about competitors' troubles. One rumor we found interesting was that IBM was stuck with 400,000 PCjr's and couldn't quite figure out what to do with them all.

This year, IBM's booth said it all. A torpid whirling robot with a PCjr for a navel tried not to knock visitors over, while a large sign proclaimed the indirect theme of the show: "IBM Personal Computer Theatre."

(continued)

## Key Tronic Pads Its New Keyboard

ATLANTA—The major manufacturer of alternative keyboards for the PC has now introduced an alternative input device on the keyboard itself.

At COMDEX, Key Tronic introduced a new compatible keyboard with a built-in

touchpad, allowing mouse-style cursor movement without the hands leaving the keyboard. The KB 5153 keyboard's 3.5- by 3.5-inch touchpad can accept four styles of input.

The sweep of a finger or sty-

lus across the pad can be read like a mouse's free-form movement or as the four cursor-key directions. In the other two input modes, the touchpad can be treated as a coordinate map of the screen or as a grid-set of up to 36 programmable function keys.

The KB 5153 reproduces the PC AT's key arrangement except that the ten function keys are in a single row across the top of the keyboard. Unlike IBM's AT keyboard, the KB 5153 can be used with an IBM PC or XT simply by changing a jumper.

Key Tronic supplies keyboards to several makers of IBM-compatible computers. The KB 5153, list price \$399.95, will be available in July from Key Tronic, P.O. Box 14687, Spokane, WA 99214, (509) 928-8000.

—By James Langdell



The KB 5153's 3.5-by-3.5-inch touchpad accepts four different inputs.



## TeleVideo's New AT Now out on the Block

ATLANTA—TeleVideo Systems, Inc. of San Jose, Calif. chose COMDEX to announce its IBM AT compatible, the TeleVideo AT. With an 8-MHz Intel 80286 chip, TeleVideo claims its AT runs 30 percent

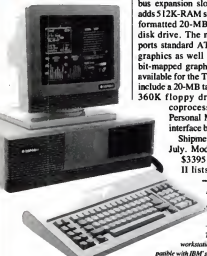
faster than IBM's.

Two configurations are available. Model I includes keyboard, a 256K-RAM system module, 1.2-megabyte floppy drive, RS-232C serial port, parallel printer port, and eight I/O bus expansion slots. Model II adds 512K-RAM standard and a formatted 20-MB Winchester disk drive. The monitor supports standard AT-compatible graphics as well as enhanced bit-mapped graphics. Options available for the TeleVideo AT include a 20-MB tape backup, a 360K floppy drive, 80287 coprocessor, and the Personal Mini network interface boards.

Shipments began in July. Model I lists for \$3395, and Model II lists for \$4795.

—By Virginia Dudek

TeleVideo's AT workstation is fully compatible with IBM's PC AT.



## IBM's PC Portable: Wanted, Dead, or Alive?

BOCA RATON, Fla.—Death reports of the IBM Portable have been greatly exaggerated, but the future of the beleaguered luggable is still uncertain.

Amid industry rumors and published speculation that the portable, which recently had a price cut, was no longer being manufactured, IBM spokesperson Rob Wilson said that it is still being marketed and shipped but declined to reveal any manufacturing information. Several recent sales have been made to large organizations and universities, he said.

"It has not been withdrawn," said Wilson.

The Portable, however, hasn't been overwhelmingly

popular with dealers.

"We've had no trouble getting Portables, but we've had trouble selling them," said Al Harding, manager of ComputerLand in Santa Fe, N. Mex. "The text quality of the Portable isn't that good; Compaq does a better job."

Harding says that the single disk drive version of the Portable is no longer available, but the two disk drive models are plentiful. He speculated that IBM is withholding the single disk drive model in order to deprive dealers of the opportunity to install non-IBM disk drives.

"They're getting back at us for adding third-party hardware," adds Harding.

## COMDEX (continued)

And IBM theatre it was. Hundreds of me-too vendors strained to thump their tubs over MS-DOS hardware and software marginally different from the excess crowding dealers' shelves. Jaded conventioners plodded from booth to booth asking each other when IBM would release its next product. A few lonely Macs glimmered in the corners.

### Lost Leads

While most of the newer products displayed were either a hair faster or more flexible than their predecessors, or were posterous answers to questions no one ever asked, a few exceptions did manage to surface. The Intel/Lotus bank-switch solution promises to help users of vast spreadsheets. Atari's Jackintosh (ST) was a true graphics dazzler, threatening the low end of the Mac market (although as a prominent retailer said, "If you can believe Lucy when she holds the football for Charlie Brown, you can believe Jack Tramiel.") Everything at the show was in full, throbbing color; COMDEX proved once and for all that monochrome is as passé as sin-

gle-sided disks. Canon's laser engine (dubbed by John Dickinson as "The Little Engine That Could") showed up in almost a dozen printer cases, and some non-Canon laser printers purred from some of the more obscure booths. Delta Data was pushing a ruggedized portable that floats in water.

Several vendors demonstrated voice-recognition systems that all had a long way to go—the premise seems now to be that if you holler single commands loudly and repetitively enough into a microphone hanging down from your ear, the recognition circuitry has maybe a 50-50 chance of getting it right. ITT's booth was wall-to-wall with attendees sneaking peeks at the FXP, after some industry pundit dubbed it "The Real PC-2." (While it was indeed an interesting XT-clone with a small footprint and a fast clock, IBM has to have something glitzier up its sleeve.) Everyone and his brother were selling svelte hard disks, AT clones, or squinty portables—and it seemed as if the entire Taiwanese and Korean monitor industry had set up shop.

One of the most startling news items was the Apricot FI—a tiny PC-compatible computer with half a megabyte of RAM, a 5-MHz 8086, a 3½-inch floppy, on-board clock driver circuitry, serial and parallel ports, a full-function infrared keyboard as well as a separate infrared mouse, MS-DOS, GEM Desktop and GEM Draw, and more—all for under a thousand bucks.

These days, most vendors are arranging product introductions before or well after COMDEX. And they're starting to stay away from these expensive shows in droves. Manufacturers no longer dread being conspicuous by their absence. COMDEX has turned from a vibrant, introduction-oriented extravaganza into something staid and far less glamorous. Products aren't the only things that have gotten smaller and cheaper—COMDEX has too. ■

"We've hardly sold any IBM Portables this year," says Hugh Manning, owner of three West Virginia ComputerLand stores. "Occasionally, someone will come in and want IBM-only hardware along with portability. It doesn't seem that IBM has any new plans for improving the product or marketing it. They either consider it to not be viable or they have something else waiting in the wings."

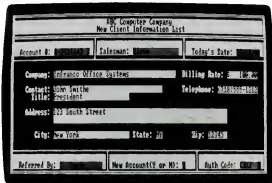
Manning says that any new laptop product from IBM would further reduce the Portable's viability.

Other criticisms of the machine include its weight, around 30 pounds, and its technical layout. A representative of Computer Mail Order in Williamsport, Penn. says that IBM offers him a less-favorable resale percentage on the Portable than on its other machines.

—By Charles Bermant

Editor's Note: Bill Steele's one Yankee who rarely crosses the Mason-Dixon Line.

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CIRCLE 172 ON READER SERVICE CARD

**Graduate Assistance . . .** The Wharton School of the University of Pennsylvania is one of 13 business graduate schools that will be receiving cash and equipment donations from IBM.

IBM will donate \$1 million in cash and \$1 million in IBM hardware and software to be used by Wharton for curriculum and faculty development, student aid, and research. Wharton will use the IBM equipment to set up a 70-station computer lab with PCs and IBM software.



Russell E. Palmer

The gift from IBM is being given under The Wharton School's program of Support for Education in the Management of Information Systems (MOIS). "This generous and timely gift from IBM will make a significant difference in Wharton's commitment to assuring that our graduates will be among the most-qualified to be-

come managers with a sophisticated understanding of how they and their organizations can profitably use these systems," says Russell E. Palmer, dean of The Wharton School.

**Portable Price Cuts . . .** They say that the portable computer market is a competitive one, so it's not surprising that two more companies have substantially reduced the prices of their computers.

Eagle Computer, Inc. has slashed the prices of its Spirit line of portable computers. The Eagle Spirit-2, with two double-sided disk drives and 256K of RAM is now \$1,495. The Spirit-2 was formerly \$2,095. The Garden Grove, Calif. company has also reduced the price of its Spirit XL, a portable with one floppy drive and a 10-megabyte hard disk, to \$2,695, \$700 less than the original cost.

Joining the bandwagon of price cutters is Data General of Westboro, Mass., which has lowered the prices of its various configurations of the DG/One portable computers by as much as \$600.

"Prices have fallen on several of the components contained in the DG/One," says Alan Oppenheimer, director of dealer marketing. As manufacturers reduce the cost of the CMOS semiconductor chips and liquid-crystal displays, Data General can pass these savings along to customers.

The price of the DG/One with 256K of random access memory and two floppy drives has been reduced to \$3,495 from the original \$4,095 price tag.

**A Gem of a Deal . . .** British computer manufacturer Apricot, Inc. is trying to launch a successful invasion of the markets on these shores, and its latest entry into the MS-DOS-compatible war brings a bundle of goodies at eye-catching low prices. For

The entry-level Apricot F1 comes with 256K of RAM.



\$1,495 you can get an Apricot F1 with 512K of memory bundled with GEM Desktop, GEM Draw, Activity (an icon-drive user interface), and an infrared mouse.

Apricot also announced a new lower price for its basic 16-bit entry-level business computer. With 256K of RAM (expandable to 768K), the Apricot F1 now costs only \$995.

GEM Desktop is a visual interface that lets the user perform operating system commands, manipulate files, and run software. GEM Draw is a graphics editor that can produce charts and other graphic images.

For more information about the bundled packages or the price cuts, contact Apricot Inc. at 3375 Scott Blvd. #342, Santa Clara, CA 95054, (408) 727-8090.

**Boot Camp . . .** This summer, the Boston Computer Society and the Summer Computer Institute at the University of New Hampshire will be having four week-long computer clinics. The courses will include a beginners' clinic, a database clinic, an integrated software clinic, and a telecommunications clinic.

Cynthia W. Harriman, director of UNH's Summer Computer Institute, says that this is the first time a user group has been involved in such extensive training. She said her program was a spin-off of the popular program started by Russ Walters.

The clinics are taught by corporate consultants, programmers, professors, and business professionals who usually charge high fees for enlightening others with their computer knowledge. "Our program," says Harriman, "gives these professionals a chance to teach in their bare feet without their ties on."

Each course, which costs \$280 (\$250 for BCS members) plus a \$25 registration fee, includes seminars, hands-on implementation of software and common problems, as well as lab time.

The Boston Computer Society is the largest organization for computer users in the world. In fact, the newest member, number 15,000, was just awarded a complimentary week at the Summer Computer Institute.

For further information about the Summer Computer Institute, contact Cynthia Harriman, 57 South St., Portsmouth, ME 03801, (603) 436-1608. The Boston Computer Society is at One Center Plaza, Boston, MA 02108, (617) 367-8080.

**Chemical Dependence . . .** Chemical Bank has a new electronic banking and information service, PRONTO Business Banker. The service, which is targeted toward small businesses with annual sales between \$500,000 and \$10 million, will allow users to conduct banking transactions from their offices.

The monthly fee for the Business Banker service is \$30, and subscribers will be given a reduced fee for Chemical's PRONTO Personal service. Subscribers can perform a wide range of money management transactions including fund transfers, balance inquiries, and credit payments. They can also have access to a business revolving credit line, electronic statements, electronic mail, business information services, as well as their personal accounts (if they are PRONTO Personal Banking subscribers).

For small businesses looking for more information about the PRONTO Business Banker, contact Pronto USA Inc., Chemical New York Corp., 52 Broadway, New York, NY 10004. ■



Cynthia W. Harriman

## IBM's Proprinter is Red, White, and Big Blue

### FIRST LOOK

BY JOHN DICKINSON

Are you tired of the same old Japanese Katana characters written all over your printer box? Tired of struggling to make sense out of the obtusities of a poorly translated Japanese

Epson-made print head (the same one used in the FX-80), the printer's 60 moving parts are marked "Made in the U.S.A."

### Swift Competition

And the Proprinter is competitive with its Japanese counterparts. In draft mode, the new printer zips along at an honest

by normal matrix printing) in such a way that the stroke widths of the characters are much finer than you would expect from a matrix printer in correspondence-quality mode. Unfortunately, the vertical strokes look a little shaky.

The Proprinter maintains a high degree of compatibility with the retiring IBM Graphics printer. Almost all command sequences are identical to the older printer's. The exception is that double-strike printing (vertical dot enhancement) has been supplanted by the new "near letter-quality" mode.

### Degree of Difference

One area of minor incompatibility is vertical line spacing. The Graphics printer spaces vertically in steps of 216ths of an inch, while the Proprinter works in 144ths of an inch. Text printing is not affected, but graphics printing (including the IBM text graphics characters) is occasionally marred by fine horizontal white "streaks."

The Proprinter manual is also domestically produced, and its excellent organization, instructional material, and good writing reflect this. The spiral-bound manual is over 100 pages long and includes a folding reference card that is easy to store in your desk or pocket.

Almost more-interesting than the Proprinter's domestic heritage is the fact that almost all of its 60 moving parts are made of high-impact plastic. Even the shaft-mounted lead screw that moves the print head back and forth is made of plastic and is driven by plastic spur gears. An occasional metal shaft shows up, the platen is aluminum (à la the retiring IBM Graphics/MX-80 printer), and the electrical connections are wire and silicon, but almost everything else is made of plastic.

Anyone driving one of today's plastic-laden cars knows that plastic no longer means cheap and cheesy, and the Proprinter seems to be a rugged enough machine for normal office or home use. It's not designed to be a 100 percent duty-cycle data processing printer, but it will do fine for most PC applications.

## Epson Not Blue Over IBM Split

NEW YORK—"No thanks, I can do it myself," seems to be the attitude of IBM toward the Epson Corporation of Japan, IBM's former supplier of Basic Printers. But Epson says it doesn't mind IBM's change of attitude all that much.

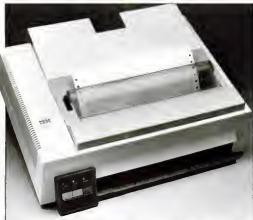
"We're not surprised by IBM's announcement at all," says Cliff Bream, vice-president of marketing at Epson America in Torrance, Calif. Bream rejects the conclusion that IBM's decision to manufacture its own PC printers is a kiss of death for Epson. He states that Epson holds 25 percent of the branded printer market and 15 percent of the OEM market. "Our OEM market share is the result of contracts with many companies," adds Bream, "and one of them is IBM."

A 3-year contract between IBM and Epson, which was terminated by IBM in early May, allowed IBM to sell a modified version of Epson's MX-80 Grafix printer under the IBM label. Epson discontinued in-house marketing of the Grafix in early 1984.

### Head Games

Bream would neither comment on what percentage of Epson's OEM market was held by IBM nor substantiate rumors that IBM is still buying printer heads from Epson. He points to the company's solid distribution system, five new printers introduced at COMDEX, and Epson's ability to compete on price.

"From IBM's perspective, the decision to manufacture their own printers is the most significant announcement they've made over the last year," says Gibbs Moody, a securities analyst at the Gartner Group in Stamford, Conn. Moody discounts Epson's short-term advantage over IBM vis-à-vis pricing and believes IBM's mass-production ability will help it to lower prices in the future. —By Virginia Dudek



IBM's \$549 Proprinter clocks in at 31 cps in near letter-quality mode.



The Proprinter's Epson print head is driven along a plastic lead screw.

printer manual? Do the words *Made in Japan* make you see red?

Well, Bunky, stand up and salute the good old red, white, and Big Blue 'cause IBM has come up with a sure cure for what ails you.

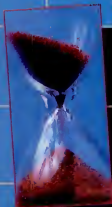
Its new \$545 Proprinter is a nifty little 200 cps correspondence-quality dot matrix printer, designed and built by the company's Information Systems Group. Except for its

91 cps (measured by *PC Magazine's* printer speed test) and hauls along at 31 cps in near letter-quality mode.

The Proprinter's near letter-quality printing is not going to win the hearts of daisywheel or laser devotees, but it will certainly do well in today's market where dot matrix output is increasingly acceptable for internal work. IBM's software engineers patented a new algorithm that fills in the dot spaces (left

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\*Actual time: 2 min/57 sec. Total files backed up: 378 consisting of 10,002,432 bytes. Computed on IBM-PC with 512K memory and one 10MB hard disk drive. Your actual back-up time may vary.

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**SHIPPING:** Add \$5 per item for UPS Surface, \$10 for UPS Blue Label. For Monitors add \$20 and Printers \$25 for shipment within continental U.S.A.

### HARDWARE

Printers (Epson, Okidata, Toshiba, NEC) .....	Call
Hercules Monochrome/Color .....	\$305/\$165
AST 6-Pak (64K) .....	\$250
M.A. Systems Pro Kit for PC Juniors .....	Call
Plantronics Color .....	\$389
Irma Card .....	\$850
Miniscribe 10MB Drive w/DTC Controller Card .....	\$695
Barnull Box 20 MB .....	\$2,495
PC Net .....	\$345

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**"As one of the 50,000 attendees to this spring's Atlanta COMDEX, what impressed, amazed, distressed, or depressed you about what you've seen at the exposition?"**

ATLANTA—Spring COMDEX found the computer industry settling into a predictable routine. Its focus was clearly on the massaging of corporate egos and the bacchanalia of nightly parties. Significant new products were conspicuous by their absence. Observers chalked this up to the industry's maturity; most hardware and software introductions were simply enhancements of what was already available.

Still, as long as there is a PC industry, there will be a need for the self-congratulatory ritual that is COMDEX. *PC Magazine's* reporters buttonholed prominent attendees for their reactions.

I see some expansion in the show and at the same time some consolidation. There are some

show, but now attendees are eliminating duplication.

**Rich Darby**  
Western Sales Manager  
Digital Communications Assoc.  
Narcess, GA

We're able to do more one-on-one communication. We're getting intelligent applications questions as opposed to general



curiosity questions. A big application in business right now is CAD/CAM. However, for specific applications, the storefront dealer has the rudiments but can't fully service the end user. The storefront is now having to become a VAR in order to service applications from automobile design to subdivision layouts. The market is not in turmoil, but it is changing. You can't sell CAD/CAM through a mom-and-pop vendor.

**Jim Bell**  
Manager of OEM/VAR Sales  
Houston Instrument  
Austin, TX

COMDEX is less important than it used to be. The sales and distribution system was once very focused on the dissemination of information. This seems to have changed. Now, it's more important to bring qualified customers through your door and to get the word out to



end users and retailers. We're considering cutting back to one COMDEX a year. You don't sell to the industry, you sell to customers.

**David Winer**  
President  
Living Videotext, Inc.  
Mountain View, CA

The new Atari 520ST system is fast and nicely done for a reasonable price. It will make a tremendous turnaround for Atari. There's also the usual mix of small and large vendors here. I sense a lot of synergy at this show, and usually go home with 6 months worth of ideas. The progress in the industry is so rapid, you have to go to a major show every 6 months.

**John Williams**  
Manager of Software  
Biflyx  
Irvine, CA

I've seen a lot of empty booths this year. Everybody's sobered up. People no longer spend \$4 million in venture capital on a "hot new product." Years ago, if you were a high-



tech company, you were automatically a "success." Now everybody's more cautious.

**Glenn Johnson**  
Director of Marketing  
Orchid Technology  
Fremont, CA

It's been a much more mature show from the point of view of attendees and vendors. We're talking to serious businesspersons who are here to do business.



ness. The super-hype and flack of earlier shows is gone. A major change in disk storage is the continuation or price erosion.

**Robert Strah**  
Vice-President  
Marketing  
Micra Data Base Systems  
Scotts Valley, CA

I haven't seen any hardware breakthroughs. In software, the most interesting thing I've seen is *S/I* by Multi Solutions, Inc., which allows software in over a dozen operating systems to run in the same system.

**David Leininger**  
District Marketing Manager  
Micra Data Base Systems  
Lafayette, IN

To me, the computer industry parallels the consumer electronics business. A lot of big companies are in the main exhibit hall, but the new innovations come from small start-up companies in the smaller hall. I've already signed up to be in the smaller hall next year.

**Craig Rawlings**  
President  
Warp Speed Computer Prods.  
Los Angeles, CA



similar products, but it's healthy for competition.

**Paul Sachse**  
President and CEO  
Softguard Systems, Inc.  
Santa Clara, CA

Though attendance in absolute numbers is down, we're seeing representatives from the major companies and major distribution channels. They seem to be economizing and sending fewer people to the show. COMDEX is still a very strong



### Put on Your High-Tech Sneakers

Agent 86, it's time to exchange your telephone shoe for the latest in electronic footwear, the computer shoe. What brand of shoe is it, Mr. Smart? Would you believe Church? Well, would you believe Gucci?

Try Puma and Adidas. These shoemakers have created running shoes with built-in computer devices that calculate how far and how fast you run and how many calories you burn.

"It's hard to think of a more hostile environment for an electronic device than on a shoe," said Peter Cavanagh, holder of a doctorate in human biomechanics and developer of the Puma RS Computer Shoe. He met this physical challenge by packing a battery-powered circuit inside a watertight chamber above the

heel of the shoe.

Here's how the shoe works: When you run home at the end of your day's exercise, take off your shoe, attach one end of the cable that comes with the shoe to the plug pins above the heel and mate the other end with your computer's game port. Next, boot up Puma's software and follow the prompt to "Read data from shoe."

This high-tech shoe is slightly more sophisticated than a mechanical pedometer; however, Puma's software accounts for the length of the runner's stride.

In late 1985, Puma USA in Framingham, Mass. will offer the Puma RS as a \$200 package for the Apple II and Commodore 64 computers. Meanwhile, an IBM-compatible shoe is cur-

rently under development.

Adidas, on the other foot, has designed its two models of the Micropacer running shoe to be standalone computers, needing no interface with a PC. The shoes display running totals on a four-digit LCD panel covering the shoe's laces. Two buttons allow you to input your weight and the length of your running pace. Each step is then sensed by a switch under the left big toe of the Micropacer shoe.

According to Adidas USA Inc. in Mountainside, N.J. its silver Micropacer made with kangaroo leather will be priced at \$125, and its Micropacer with nylon uppers will retail for \$100 when the two models are introduced this October.

This new computer-shoe technology will certainly give a fresh meaning to the term booting up.

### Pitching Today . . . Mel Allen!

"Hello there, everybody." When the folks at Random House Software held a press conference in New York to launch its new game, *APBA Major League Players Baseball*, they found the perfect man to work the crowd into a cheering frenzy. Mel Allen, the 71-year-old announcer famed as the "Voice of the Yankees" was on hand to make dramatic play-by-play calls for a Mets-Yankees baseball game simulated on an IBM PC.

The APBA software itself talks a pretty good game, describing the moves in each play on six lines beneath the screen's scoreboard. But purchasers of this \$89.95 game might be disappointed: Mel Allen himself isn't packaged with every set of disks.

If anyone tries adding a speech synthesizer to this computerized baseball game, Mel Allen's given them a tough act to follow.

How 'bout that, fans? ■



### Yes, and Mondale Will Win in '88

Information and Systems Research, Inc. of Coraopolis, Penn., recently sent us a press release that is, to put it mildly, one of the most self-assured announcements we can remember reading. Without further comment, here is the first sentence:

"The enclosed news release represents ISR's very first public announcement about ABG (Application Builder/Code Generator), a revolutionary application software development system which, in ISR's opinion, will become every bit as popular as Lotus's 1-2-3 and/or dBASE III!" ■

### The New and Improved Testament

In the beginning was The Word. And The Word was on disk. And now The Word has received an update due for more than 360 years.

THE WORD Processor is a software package that contains the full text of the Bible along with programs to assist in the study of the scriptures. In its latest release, Version 3.0, this program puts a modern translation of the Good Book on disk. Until now, the King James Version of 1611 was the translation used in Biblical software because modern translations are still protected by copyright.

For the past 3 years, however, the creators of THE WORD Processor have plied publishers of copyrighted Bibles to use their texts. Finally, the International Bible Society of New

Brunswick, N.J. agreed to enter the electronic age with its New International Version, a translation first published in 1973.

Indeciding to computerize its Bible, the Society may have been moved by good old-fashioned missionary zeal. Bert Brown of Bible Research Systems, which produces the software, says, "It's easier to bring the Bible behind the Iron Curtain on disks than in printed books."

THE WORD Processor, Version 3.0 is available for \$199.95 from Bible Research Systems, 9415 Burnet Road #208, Austin, TX 78758, (512) 835-7981. ■



## Cleaning Sloppy Disks

If you ever smear butter on a gray Polaroid disk because you mistook it for a piece of toast, Polaroid claims it can help pull the fat out of your files.

Whenever Polaroid's Professional Quality Diskettes are damaged or defiled, users can send them back to the manufacturer's Data Recovery Center in Cleveland, free of charge.

There, Polaroid will clean the disk using its proprietary solvent process, transfer any intact data onto a fresh disk, and send it back to the customer. If all the

data is lost, Polaroid sends a fresh blank disk to give the customer some consolation.

In its unusual press kit, Polaroid packed portions of mustard, catsup, French dressing, instant coffee, cocoa, grape jelly, and a tiny cigar. We were urged to store some files on the Polaroid disk and abuse it with dabs, dabs, smoke, and ash from all the above goodies. Then, we shipped the mess to Cleveland, hoping to get it back good as new. Thank goodness Polaroid didn't send ice cream samples in this press kit. ■



## Know How to Hold 'Em Know How to Fold 'Em

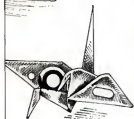
A new program makes it possible to do your paperwork Japanese-style. This software, instead of making ledger sheets and form letters, will convert sheets of paper into rabbits, insects, fish, and penguins.

*Origami* is a BASIC program created by George Furiya that teaches the oriental art of paper folding. The disk offers fold-by-fold instructions for making a dozen interesting creatures and objects

with small squares of colorful paper.

The screen diagrams clearly simulate the actual appearance of the paper as it takes three-dimensional form. Animation is used to demonstrate the execution of each fold. If an instruction confuses you, the program will provide an instant replay on request.

The *Origami* package, which includes a program disk, 100 sheets of paper, and a straightedge, is available for \$19.95 from Origami Software, 299 State St., Brooklyn, NY 11201. ■



## Behind the Green Screen

Hot stuff! That's what I thought when I heard about XNET, an "adult-oriented" computer service. (Not to be confused with X-Net software made by Xcomp of San Diego, Calif.) Now I can get my hands on some sexy stuff with action as fast as my modems, thanks to XNET's special-interest bulletin boards dedicated to couples, swing clubs, escort services, movies, and "serious relationships." It's a sure bet XNET's on-line "Dear Veronica" could teach Ann Landers a trick or two. And XNET even has electronic mail—I can feel it sizzling in my receiver already.

Who cares if XNET charges a \$25 subscription fee and \$5 for monthly rental of an electronic mailbox, not to mention communications charges that range from \$7 to \$16 per hour? What price paradise, eh?

I couldn't wait to get my application form after getting in touch with XNET Computer

Services, P.O. Box 2365, Halesite, NY 11743, (516) 549-0811. XNET can be reached by modem at (516) 549-0845. I ripped open the envelope as soon as it came and fever-



ishly filled in the blanks, thrilled to tell all.

Suddenly, my passion fled when I reached a line asking for my "Mother's Maiden Name (if password lost)." Ohmigod!

Why did they have to drag my mother into this sordid business? If XNET ever tells mom I'm messing around on an X-rated bulletin board, she'll kill me!

Sorry, XNET. The thrill is gone. —J. L.

## Accountants Just Wanna Have Fun

How many tax deductions could Ozzie and Harriet have claimed?

Was the Bat Cave 100 percent allowable as a business expense?

Over how many years could Jerry Van Dyke depreciate "My Mother, The Car?"

Well, all right. Those aren't the questions used in the Accounting Trivia segment of *CPA Yardstick*, but maybe they should be. *CPA Yardstick* is a program from MicroMash that

prepares prospective accountants for the rigorous CPA examinations.

It contains over 800 multiple-choice questions used on past certification exams in the categories of auditing, business law, theory, and practice. *Yardstick* programs can be used as drills before taking a professional certification exam.

But when the working day ends, and accountants close their books and pop open a few cool ones, it's Trivia Time! And *Yardstick* makes it possible for even a shy auditor to be hailed as the life of the party if he knows the difference between "dividend income" and "a deduction from the investment account."

MicroMash is located at P.O. Box 6512, Huntsville, TX 77340. *CPA Yardstick* costs \$99. MicroMash also makes *CPA Review* (\$399), instructional software that gives the real "why" behind the quiz's answers. However, neither of the aforementioned programs will help those wondering how much of Bob Newhart's psychologist's fee was tax deductible. ■

Have computers surprised you lately? If you have discovered something unusually useful or simply unusual, we'd like to hear about it. Should we use your news in the *Communiqués* pages, we'll pay you \$50. Please write to *Communiqués*, PC Magazine, One Park Avenue, New York, NY 10016; MCI Mail 157-9301, or phone James Langdell at (212) 503-5264.

# BUYERS GUIDE TO PRINTER UTILITIES

Printer Boss  
Connecticut Software

Sideline  
Funt Software

Sideways  
Funt Software

Brand X  
Typical

## Custom font design

Draft mode	YES	NO	NO	YES
Quoted density	YES	NO	NO	NO
LQ-1500	YES	NO	NO	NO
LQ-1500	YES	NO	NO	NO
LQ-1500	YES	NO	NO	YES
Graphics mode screen display	YES	YES	NO	NO
Single-key current character test print	YES	YES	NO	NO
Custom font loading from menu	YES	YES	NO	YES
Unlimited custom font library	YES	NO	NO	YES

## Alternate character sets on menu

IBM Matrix character set	YES	NO	NO	NO(7)
IBM Graphics 1 character set	YES	NO	NO	NO(7)
IBM Graphics 2 character set	YES	NO	NO	NO(7)
IBM Screen character set	YES	NO	NO	NO(7)
IBM APL set	YES	NO	NO	NO
Graphics characters link vertically	YES	YES(8)	NO	NO
Simulated download, MX, RX, etc	YES	YES(8)	NO	NO

## Supports pathnames

Configuration, font and print files	YES	YES	NO	NO
-------------------------------------	-----	-----	----	----

## Printer format control

Elite, compressed, enhanced, etc	YES	YES	NO	YES
Line spacing	YES	YES(9)	NO	YES
-n/180 (LQ-1500)	YES	YES(9)	NO	NO
Right & left margin	YES	YES(9)	NO	YES
Set form length lines & inches	YES	NO	NO	YES
Set undirectional printing	YES	NO	NO	YES
Set half-speed & proportional printing	YES	NO	NO	YES
Select 9 Epson language sets	YES	NO	NO	YES

## Letter quality graphics printing

Double density graphics	YES	NO	NO	NO
Quad density graphics	YES	NO	NO	NO

## RAM printer buffer up to 32K

Buffer overflow control	YES	NO	NO	NO
Print current buffer control	YES	NO	NO	NO
Abort current buffer control	YES	NO	NO	NO

## Command line printer setup control

Autoexec bat file operation	YES	YES	NO	NO
Unlimited stored settings recall	YES	YES	NO	NO

## Unlimited menu setting store & recall

Single-key reset to default settings	YES	YES	NO	YES
Configuration file settings storage	YES	YES	NO	NO

## Sideways printing

Menu selection of font sizes	YES	YES	YES	NO(6)
Full 256-character fonts	YES	YES	NO	NO
Sideways font design	YES	YES	NO	YES
One-piece "glued" spreadsheet output	YES	YES	YES	NO
Character & line spacing control	YES	YES	YES	NO
Left margin control	YES(10)	YES(10)	YES	NO
Top & bottom margin control	YES	YES	YES	NO
Paper width choice(8" or 15")	YES	YES	YES	NO
Printer selection from menu	YES	YES	NO(1)	NO(1)
Menu printer port selection	YES	YES	YES	NO
Commands independent of Lotus version	YES	YES	NO(2)	YES
Spreadsheet page setting constant	YES	YES	NO(3)	NO(11)
Requires input of # of rows ONLY	YES	YES	NO(5)	NO(11)
Avoids user calculation of "gluelines"	YES	YES	NO(4)	NO(11)

## Special features

Typewriter output mode	YES	YES	NO	YES(9)
Printer setup admin feature	YES	YES	NO	NO
Print direct from word processor	YES	NO	NO	NO
Supports function keys	YES	YES	NO	NO
Master select code feature	YES	NO	NO	NO
Enable Epson NLO option	YES	NO	NO	NO
Directory default change from menu	YES	YES	NO	NO
Drive default change from menu	YES	YES	NO	NO
Indicates unavailable options	YES	YES	NO	NO
Single-key sample print routine	YES	YES	NO	YES
Printer selection from menu	YES	YES	NO(1)	NO
Mouse software interface	YES	YES	NO	NO
Help screens	YES	YES	NO	NO
Single menu, all features	YES	YES	NO	NO

## Price

Published list	135.00	55.00	50.00	?
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**If you bought  
Sideways,<sup>TM</sup>  
it's time to  
upgrade.**

**To  
Printer Boss.<sup>TM</sup>**

Printing spreadsheets sideways is one of the hardest software tricks to come out of the PC revolution. And Sideways<sup>TM</sup> is a nice little program. But...

**Sideways doesn't** support pathnames, and doesn't let you design your own sideways character font, and doesn't let you store an unlimited number of menu settings, and doesn't let you call menu settings from a command line or batch file, and doesn't give you typewriter output mode. And Brand X doesn't either.

**Printer Boss does** give you all of these things, plus almost everything else you could ever want in printer utility software for the dot-matrix printer, including two letter quality print modes (see chart). And it's all controlled from a plain-English menu, with a few key-strokes, and all controllable via command line from an autoexec. bat file.

**And Sideline<sup>TM</sup>** is for those who want sideways printing only, at a special price of \$59.95. It includes sideways printing, sideways font design, typewriter mode, command line input, menu settings storage and much more.

**Don't settle for less.** If you bought Sideways, or Brand X, it's time to upgrade. To Printer Boss, or Sideline. From Connecticut Software. For the IBM-PC, PCjr, XT, AT and compatibles, 128K RAM, one double-sided drive and PC-DOS 2.0, 2.1, 3.0. Runs on all Epson and IBM dot-matrix printers and all compatibles. Printer Boss \$139.95, unprotected backup \$29.95, Sideline unprotected \$59.95. Shipping \$4.00 each, outside USA \$15.00. COD add \$2.00. USA only. VISA, MC, money order or check. Purchase orders accepted. Dealers welcome. Free info.

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NOTES: Comparisons of Printer Boss & Sideline V5.0 to April 85, Sideways V2.0 purchased 02Apr85 (1)Requires exit to installation program (2)Requires different procedures for Lotus versions 1, 1A and 1A+ (3)Requires booting Sideways first to check possible number of lines per page for formatted files (4)Not always, user must calculate gluelines number as suitable multiple of page length for unformatted files (5)Printer Boss and Sideline require only filename and number of rows in spreadsheet (6)Font size selectable on downloadable printers only by print mode selection (7)Not provided as menu choice but partially as font choice (8)Available only on some printers (9)Typewriter mode only (10)In printer setup string (11)Does not provide horizontal segmentation "gluing" TRADEMARKS Sideways is a trademark of Funt Software Inc. Epson is a trademark of Epson Corporation.

 **Connecticut Software**



### Look into the new Princeton HX-9 Series

See high-resolution RGB color with the Princeton HX-9 and HX-9E Color Monitors.

Observe exceptionally sharp high resolution graphics and text created by color phosphor dots which are within a mere .28mm of one another.

Enjoy Princeton performance on a 9-inch screen in less desk space than most any other monitor on the market today.

### Display images of clearly superior quality

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# The Disks of Summer: A Top Doubleheader

## PRODUCT REVIEW

BY COREY SANDLER

Baseball is a higher form of mathematics. The real joy of the game comes from numbers—the arithmetic of batting averages multiplied by the calculus of the scorecard compounded by the perfect geometry of the baselines.

Baseball may also be the original national database. Long before the Internal Revenue Service or Social Security were born, well before Dow met Jones, the scribes of baseball were hard at work recording out by out, hit by hit, and game by game the progress of baseball. As Professor Stengel taught us, "You could look it up."

*Pro Manager* from Avalon Hill is a competent simulation of major league baseball. It's not an arcade game—there is no crack of the bat or roar of the crowd or even much in the way of a screen display—but for the true fan, there is the excitement of mathematically structured matchups of real current and past teams with a more-than-passing resemblance to real-life outcomes.

All 26 American and National League teams are included on

**Pro Manager**  
Microcomputer Games,  
Incorporated  
Avalon Hill  
Game Company  
Baltimore, MD 21214  
(301) 254-9200  
List Price: \$35  
Requires: 128K RAM,  
one disk drive, color  
monochrome adapter, and  
monitor.

**The Baseball Statbook**  
RJI Systems  
106 New Haven Ave.  
New Milford, CT 06460  
(203) 878-0376  
List Price: \$41  
Requires: 128K RAM,  
one disk drive, and printer.

disk with their 1984 season statistics in addition to 16 more great teams of the past, including: the 1927 Yankees of Ruth and Gehrig, Stan Musial's 1946 St. Louis team, the 1954 New York Giants, the 1955 Brooklyn Dodgers, the Pirates of 1960, the Yankees of 1961, the Dodgers of Los Angeles in 1965, the 1969 wonder Mets, the miracle Red Sox of 1975, their scrappy Cincinnati opponents of that same year, and the 1977 NY Yankees.

Here's your chance to pit Sandy Koufax against Dwight Gooden in a strikeout contest, or try the Babe against Reggie Jackson in October. The program allows for trading of players from one team to another, or for the creation of your own all-time All-Star team. You can also add new players to the database by entering their vital statistics.

## Top Management

The game can be played with two managers or with the computer making decisions for one team. You can choose your own lineup or ask the computer to select an appropriate one from its record book. On offense, you can have your players hit away, bunt, hit and run, steal, pinch hit, and pinch run. On defense, the manager can pitch around a batter or intentionally walk him, pull the infield in to try to keep a runner on third, or guard the baselines in late innings. Defensive changes, including substitution of pitchers and fielders, can be called for.

Rummaging through the rubble in the trunk of my car, I found the complete scorecard to a game I attended last season. I put the same lineups into the computer and sat back to watch

what turned out to be nearly a replay. Last August, the Mets dominated Montreal 6-1 behind the five-hit, nine-strikeout pitching of Gooden. In the replay on my desktop, Gooden triumphed again with a four-hit, nine-strikeout 4-1 victory. The offensive stars of the real game were Mookie Wilson and Kevin Chapman, who between them accounted for three hits, two walks, and three runs; in the computer replay, the same two players had three hits, one walk, and scored a pair of runs. George Foster had the winning RBI in the real-world and the computer league games.

A coincidence? Maybe. Not that I'm a betting man, you understand, but the thought did occur to me that if one were the sort to take the office baseball

"Rainout Theater" on the tube any time.

## Personal Bests

When you get right down to it, though, the really important statistic in your personal sporting life may be the performance of the star short-centerfielder of Willie's Cross Key Lounge Lizards in the Chillicothe All-Star Summer Softball League. If they don't publish the on-base percentage, slugging average, and stolen base ratio in the *Gazette*, you might instead want to try out *The Baseball Statbook*. This program will maintain a full season's worth of data on a baseball, softball, or little league team, producing all of the statistics a would-be George Steinbrenner could ever demand.

*The Baseball Statbook* is a



pool very seriously, this game might belong on your hard disk along with *dBASE II*.

Avalon-Hill is the reigning champion of board game simulations, with a line of sports, historical, and military games. The company's computer products of the last few years, though, have not been distinguished efforts, showing very little use of the computer as anything more than a scorekeeper. *Pro Manager* uses the computer properly in managing a comprehensive database, although Avalon-Hill still does not seem to want to invest time or effort in on-screen graphics. This product seems to be a "plain vanilla" offering designed to be ported over to whatever computer is currently hot.

In any case, I can recommend this game to any dedicated baseball fan—it'll beat

competent piece of work, handicapped slightly by a disorganized and terse manual and a rather inflexible entry method for player names and game results. The product could have benefited greatly from a more free-form style of entry such as the ones now used by many database programs. Written in COBOL, the program is not copy-protected and can be run from a hard disk or floppy-based system. The package will only record the results of a single team on a single disk or subdirectory; to maintain records on a league, you'll have to establish separate disks or subdirectories for each team.

The program can even print out your own scoring summary for on-the-scene stats, which beats bringing a 600-foot extension cord and your PC to your child's Little League game. ■

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## PC UPDATE by VIRGINIA DUDEK

NEW YORK - Just out from MultiMate International of East Hartford, Conn. is a local area network version of the MultiMate Professional Word Processor Version 3.3. This version supports the IBM PC Network, 3Com Ethernet, and Novell Netware/86 (Version 4.6 or higher). MultiMate's initial license allows three users to operate the network, with an additional charge for more licensees. The LAN version also offers standardization of office document handling, file sharing, and electronic data transfer between work stations in the LAN. Updates are available from the customer service division at MultiMate International.

And for those of you who parlez French, Spanish, Swedish, Norwegian, or Danish, MultiMate now comes in these five foreign languages. A spokesperson notes that aside from the language differences, the performance of the products is on the same level as the original English versions.

**EasyPlus** Version 1.1 from Sorcim/IUS of San Jose, Calif. now allows integration of software within the **EasyBusiness Systems Plus** series and includes a windowing environment that can import a range of popular business software. The windows let users work simultaneously with 1-2-3, SuperCalc 3, Framework, WordStar, and 15 other programs. Many of these outside programs can take on MultiMate windowing functions such as transferring files and the built-in macro feature. Most applications will run full screen, and the colors as well as the size of the screen can be changed. Users can also open up a DOS window in Version 1.1 and create directories for copying programs. It is not necessary to exit the program to perform these and other DOS functions.

Individuals can contact Sorcim/IUS or their dealer for an upgrade. If EasyPlus Version 1.0 was purchased between March 1 and July 1, 1985, the upgrade is free. Upgrades for purchases prior to March 1 are \$50. After July 1, Version 1.1 is available

at full price through dealers.

**Pick Systems** of Irvine, Calif., the people who brought you the Pick operating system, announced **Pick System Version 1.3** for the PC-XT. Version 1.3 has also been tested on six XT compatibles: the Compaq Plus, Compaq DeskPro, NCR-PC4, ITT-XTRA, Sperry PC and Ericsson PC. With the XT version of the program you can add 10.5 megabytes over the memory that comes with the PC. You can also configure the operating system to run on the compatibles listed above. Updates are available from the Pick dealer network.



Short takes: **Design Board Professional Software**, a series of CAD and drafting software for PCs from MEGA CADD Inc. of Seattle, Wash. can now be used with a greater range of peripherals. These include the Hewlett Packard 74/75, Houston Instruments DMP, IO Line, and Roland plotters as well as all Epson-compatible dot-matrix printers. Contact MEGA CADD at (206) 623-6245 for a complete list. **KeyMailer** Version 2.0 is out from SoftKey Software Products of Monte Sereno, Calif. New features include automatic mail merge with MultiMate, WordStar, Word Perfect and SuperWriter, as well as database management, menu-driven report, and personalized form-letter generation. "It's worlds above Version 1.5," claims president Kevin O'Leary. Updates are \$39.95 for new disks, documentation, and utility to upgrade old files. Contact SoftKey.

Be a contributor to PC Update. Write or call Virginia Dudek, PC Magazine, One Park Ave., NY, NY 10016 (212) 503-5265.

## Following DPATH

Just after Volume 4 Number 11 of *PC Magazine* went to press, a new version of Personal Business Solutions's **DPATH** file-path utility was released. The new release (2.0) includes some significant improvements over the version tested previously (1.3).

Version 1.3 was uncomfortable to use because of a nonstandard data-path syntax. This syntax problem has almost been fixed in the latest release, which uses the same syntax as the DOS **PATH** command, but with a dif-

ferent result—the data paths specified accumulate unless you use special switches to disable your earlier, specified DOS data paths.

You can get around this accumulation by using **DPATH's** simple full-screen data-path editor to specify and change your data paths (invoked through the **DMAIN** program). But this specification process is time-consuming, and you may not want to use it after becoming accustomed to the program. You might be better

off learning how **DPATH's** switches work. But don't get too settled in your ways because a new release of the program is on the way that makes cumulative path-specification optional. In addition, **DPATH 2.0** adds extended directory syntax (using DOS-like wildcards). The next release of the file utility will also add a program execution option.

### Performance Test

**DPATH** works well enough once you've learned how to specify a path with its semistandard syntax. Several programs, including **IBM Per-**

**sonal Editor**, **pfs:file**, and the **IBM Macro Assembler** found files with no trouble. **XiWrite**, however, insisted on heading west whenever **DPATH** helped find files. It turned out to be a minor problem that Personal Business Solutions has since fixed. My experience with this problem indicates that you can expect strong customer support if you buy **DPATH**.

**DPATH** is a relatively new product that has been greatly improved compared to its earlier versions, and it's well worth considering if you need help looking for your files.

—By John Dickinson

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#### Cross Reference Utility for the Macro Assembler

- Creates a cross-reference listing of the definitions and locations of all symbols used in an assembly language program.



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# MARTY ALPERT: Building An Add-On Empire

BY CHARLES BERMANT

SOLON, Ohio—Marty Alpert is like a boxer who has won a key bout. As president of Tecmar, a leader in the production of tape backup subsystems for the IBM PC, he has scored an important decision over his competitors. His hardware is now offered in IBM Product Centers across the country.

Just 6 months ago, the official word from IBM was that disk backup was the ticket. Big Blue had no plan to introduce a tape backup system. The company was obviously pulling its punches because in fact, it was moving ahead with a plan to offer Tecmar products in its retail outlets.

"The sales of our units through the Product Centers have been overwhelming," says Alpert. "There has been a huge, pent-up demand. IBM has seen the need for tape backup for awhile. It evaluated the options carefully, as always."

## Tale of the Tape

In the past few months, more tape backup systems have been introduced by other vendors than luminaries at a championship fight. Alpert says that the speed and ease of use of Tecmar's systems led to its special agreement with IBM. He says that being offered in the Product Centers is a real boost, an endorsement not only for tape technology but for the Tecmar tape operating format as well. His competitors, of course, display mixed emotions about the action:

"Offering Tecmar in the Product Centers," says Alloy president Nigel Spicer, "is IBM's way of endorsing tape without getting involved."

"IBM is starting to express interest in tape," says Tallgrass president Dave Allen. "With this, there has to be an element of endorsement. But it's significant that IBM elected to keep its name off the Tecmar product."

Alpert counters that putting IBM's logo on the product line was never an option. "It is a

first COMDEX, Tecmar unveiled a line of 20 add-on boards for the PC. Now, Alpert says, an add-on can be developed in as little as 3 days and be up to marketing speed a month later. Since that first entry, he has led the PC add-on product charge, filling the gaps between IBM offerings and customer needs.

It's a well-known story that Alpert drove to Chicago and bought the first two PCs ever sold through retail channels in October of 1981.

Tecmar product and has to be sold as such." He concedes, however, that it will take a tremendous effort to make any one tape operating system a standard and that the decision will be made in the marketplace.

## Cleveland Rocks

An Ohio native, Alpert has always run Tecmar from Solon, a Cleveland suburb. He feels that this location has been an advantage for the company.

"We're the big kids on the block," he says. "We get things done quickly, and we don't have to compete for intellectual resources. And we have access to a good midwestern work force."

Alpert, a pulmonary physician who also has an engineering background, founded Tecmar in 1974 after designing a computerized lung diagnosis system. Tecmar's beginning as a manufacturer of scientific computer equipment was side-tracked by the PC boom. It's a well-known story that Alpert drove to Chicago and bought the first two PCs ever sold through retail channels in October of 1981. A month or so later, at the

Tecmar has built a peripheral fortune for the PC, with memory, multifunction, hard disk, communications, graphics, video, and voice products. Alpert heads a staff of 600 that manufactures about 100 PC-compatible and Apple Macintosh peripherals plus a line of scientific computer equipment.

## Science Shift

To compensate for the loss of attention to its scientific clients, for whom the company was originally formed, the Tecmar line of 50 scientific and engineering products was shifted to a new subsidiary, Scientific Solutions, Inc. (SSI). Established 2 months ago, the SSI line includes PC peripherals that enable desktop computers to perform highly specialized, laboratory-oriented tasks. There will be new marketing campaigns for the SSI products.

Tecmar has manufactured add-ons for PC/XTs and ATs alike, and it expects to monitor the market to see how many Junior products are still needed. All along, the company's judgment and luck in reading the



marketplace has been considerable. "Tecmar is one company I watch closely," says competitor Spicer. "If they are in a particular market, that means you can be in the same market with impunity."

## Pressed Pundit

When asked to speculate about IBM's mysterious PC-2, Alpert first offers a "no comment," then speculates that half a dozen versions of such a machine may exist. When the time comes to introduce the product, he says, IBM will choose the one best suited to the current market.

Pressed for predictions, he says the rumored machine could have a small package, an 80286 processor, two 3½-inch disk drives, room for a fixed disk, two or three expansion slots (all that is needed for the majority of peripherals), a choice of screens, and a detachable keyboard.

All of this, however, is guesswork. "A lot of people show us advance systems," he says. "IBM is not one."

Alpert isn't prejudiced. Tecmar products are offered for both the PC and Macintosh markets. While the competition for the business market is heating up, he feels there are more similarities than differences between the two.

"In the future, communications will control computing, not the other way around. We're seeing communication become a substitute for transportation, and when this happens, it will become less important if you have a PC or a Mac."

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\*C\* Benchmarks—done on a Compaq Plus with 512k memory with no 8087. Program "SIEVE", with register variables.

	Exec Time	Code Size	EXE Size
Microsoft C	:9.39	141	5,914
Lattice C	:12.24	164	20,072

\*Purchase both Microsoft C Compiler and Microsoft Macro Assembler and get a \$25 rebate direct from Microsoft. See package for details.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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# New DOS Programs Give Command Performances for PCs

## Starbridge DOS

Far too many people equate learning to use DOS with learning to speak Greek. Well, here's a single-key menu interface for the IBM disk operating system that insulates the user from everything remotely technical. It's called *Starbridge DOS* (Starbridge Technologies Corp., 1925 Century Park E., Los Angeles, CA 90067; \$49.95; for PC, PCjr, XT, AT, and compatibles; requires 128K RAM, DOS 2.x).

On either a floppy or hard disk system, *Starbridge DOS* presents a single screen divided into four areas: A user-created menu for automatically starting up to nine programs, a menu for changing system parameters and accessing help, a menu of DOS commands, and a box for input and prompts. The idea of simplifying daily computer operations for the beginner is a good one, and this program is exceedingly easy to use. However, only the most basic of activities and DOS commands can be performed with *Starbridge DOS*. It's for the true neophyte.

## Quink

Just as the market for computer games has reached new depths of depression, a program that shines brightly on the PC comes along. It's called *Quink*, a one- or two-player, how-fast-can-you-think affair that combines knowledge and fun into a game few people will turn down.

*Quink* is a game of information (CBS Software, One Fawcett Place, Greenwich, CT 06836; \$34.95; for PC or PCjr; requires 128K RAM, color/graphics adapter, DOS 1.x). The screen displays a 3 x 3 grid of boxes that correspond to the keys 1-9 on the numeric keypad. Each box except the center one contains a one- or two-word description of various



Starbridge DOS from Starbridge Technologies

items, some of which belong to the same category. Categories include Measuring Devices, Organs of the Body, Gemstones, and so on. Your job is to determine the category by eliminating all items that don't fit. There are seven related items in the first round, but only six in the next, five in the following, and so on, which is what makes the game so fascinating.

## The Art Studio

*The Art Studio* (Spectrum Holobyte, Inc., 1050 Walnut, Suite 325, Boulder, CO 80302; \$49.95; for PC, PCjr, XT, AT, and compatibles; requires 128K RAM, DOS 2.x) is a freestyle artistic graphics package. You can draw lines, rays, rectangles, arcs, circles, and ellipses, paint with brushes or a "spray can," and fill areas with colors and patterns. If you don't use color, you can get 640 x 200 pixel resolution. *The Art Studio* presents commands as a pictorial menu surrounding your work. The program works extremely well with a mouse, much better than with the keyboard. Still, its less-than-intuitive icons lengthen the learning process.

## E-Z-DOS-IT

Do you find yourself waiting to use your word processor while your database sorts through 2,000 records? One solution is to buy a second PC.



The Art Studio from Spectrum Holobyte

Another is to buy *E-Z-DOS-IT*, a program that effectively splits your PC into halves, or thirds, or quarters, and lets you run programs simultaneously. *E-Z-DOS-IT* (Hammer Computer Systems, Inc., 700 Larkspur Landing Circle #285, Larkspur, CA 94939; \$199.95; for PC, PCjr, XT, AT, and compatibles; requires 256K RAM, DOS 2.x) requires you to create a default setup screen that partitions available RAM for the programs you'll want to run concurrently. There is room on the setup screen for information about each of eight programs. So, if you have enough memory and your programs are small enough, you could run all eight at once! Moving between any two programs while both are processing is simple once you achieve a proper installation, though there is high potential for error up to that point. Improved documentation from Hammer would help.

## Disk Performance Program

*The Disk Performance Program* should be a "must have" for PC AT hard disk shoppers. With it you can determine actual access times of hard disks with a series of three automatic tests. First, the drive's tracks are tested as it reads contiguous data. Then the drive is tested with random as well as contiguous data. And finally, there is a test of true random access. Each test consists of

1,000 seeks, and results are reported in milliseconds. Try *Disk Performance Program* from Core International, Inc., 542 S.E. 5th Ave., Delray Beach, FL 33444; \$20 on disk, or free if downloaded from PC's Interactive Reader System (PC-IRS) at (212) 696-0360. It runs on any IBM compatible with a hard disk and requires 64K RAM, DOS 2.x+.

## Instat-QC

There are many ways to perform statistical analysis inexpensively and quickly. *Instat-QC*, certainly the "no frills" approach, is one. The program analyzes data to produce six types of quality control charts: mean of normal sample (controlling high values, low values, or both), standard deviation, fraction of defectives, and frequency of defects.

Using simple equations, *Instat-QC* monitors quality control of mass-production processes with ease. The program also allows you to add a target value, control limits, and specification limits to help define the production process as "in control" or "out of control." Results are charted numerically as well as statistically and can be sent to either screen or printer. *Instat-QC* (Statistical Consulting Services, 517 E. Lodge Dr., Tempe, AZ 85283; \$150; for PC or compatible; requires 64K RAM, DOS 1.x+) isn't fancy, and it doesn't make statistics fun, but it really works. ■

PARITY CHECK by STEPHEN MANES

# A Computer Course in Classical Appreciation



Ten minutes after you buy the luxurious new 1985-1/2 GT spreadsheet, the salesman drives by in the 1985-184/365 model with the electronic mail fins. Planned obsolescence or just progress? Hard to say; in the land of computers, impermanence is the only constant.

Under these conditions, infatuation fades fast. People who were utterly flabbergasted by the capabilities of their hardware and software a year or so ago suddenly see their friends' newer models, begin to feel slightly inadequate, and start looking for a new drug, hard or soft, to bring back the original high. With the itch of junkies, they contemplate abandoning their tried-and-true machines and programs for something a little newer, a little slicker, a little fancier.

My advice to these restless souls? Relax. What you're using is probably better than what you need. The improvements you'll see from any product change are likely to be mostly incremental. And there are plenty of good reasons to stick with the old standards that have mustered clear pluralities if not outright majorities—programs like *WordStar*, 1-2-3, *dBASE*, and *PraKey*, and hardware like the IBM PC and XT and the Compaq.

## Playing the Classics

These classics and others like them have been around long enough to become known quantities. For the most part, they're extremely reliable, and their idiosyncrasies are reasonably well known by now. Their user interfaces have become commonplace. The only way to exit *Turbo Pascal's* program editor, for example, is with a key sequence

utterly mystifying to everybody but *WordStar* users: Ctrl-KD. And the third-party documentation these programs have generated helps enormously: If you can't find it in the official manual, chances are you can find out all you need to know in a book, article, or on-line training course.

When you run into a problem with the classics, there's usually somebody down the block or in the user group who's solved it already. In every burg and hamlet across the land you can bet

times the standards won't do what you want them to, and sometimes the newcomer does things significantly better or faster. 1-2-3, you will recall, supplanted the once-standard *VisiCalc*; *WordStar* cleaned *Easy Writer's* clock. Something in development at this minute is undoubtedly the "classic" of tomorrow.

## Switch Hits

Still, consider the following before you make a switch:

*Is there a way to accomplish*

**The improvements you'll see from any product change are mostly incremental.**

there's at least one lady or gent who can recite *WordStar* commands, 1-2-3 macros, or *dBASE* instructions without even pausing for breath, and someone who can stuff a card into a PC or a Compaq faster than you can say "screwdriver."

Another big plus with the classics is the wide variety of add-ons available for them. To this day, IBM does not make a multifunction card for the PC, but everybody else but my second cousin does. And just try and find one for an incompatible machine. By now, *WordStar* has inspired writing tools from thesauruses to style checkers, *dBASE* has called forth all sorts of programming aids, and 1-2-3 has elicited templates that do everything but help you cheat on your income taxes. In sum, going with the standards opens you to a whole universe of assistants.

So why ever use anything else? Why take a chance on some newcomer or oddball piece of software? Well, some-

times the standards won't do what you need without making a change? Before you pick the current program because you're positive it won't do something you absolutely need, take a close look at the manual again, check out a book, and hunt around for an expert. 1-2-3 manuals, for example, have discovered truly unbelievable hidden powers tucked away in the macros. It's all in knowing the secrets, but those are not always easy to come by.

Don't rule out hardware salutations to software problems. Many people who detest *WordStar* and other multi-overlay programs find that extra memory and a RAMdisk make them sing. A database program that's slow on the uptake from a floppy may be fine with a hard disk. And the added hardware usually confers additional benefits as well.

Check into add-on software. In addition to their many other benefits, programs like *PraKey* and *SideKick* solve many of *WordStar's* problems. But they

can't handle them all. If you're doing lots of footnotes or running a laser printer, for example, you really need something like *Micrasoft Word* that's equipped for such things.

How much effort will it take to gain the supposed benefits of the new stuff? Switching to a new program can cause all sorts of unexpected grief. First, it takes time to learn how to make the newcomer do its stuff. Your second program in a particular genre is almost always easier to master than your first, but while "unlearning," you may keep hitting the wrong keys for weeks.

Then there's file conversion. If your files are in *WordStar* format, adapting them to another word processor will take time. Modifying a complicated database for use with a different program can be anything from duck soup to darned near impossible. And spreadsheet incompatibilities abound, even between Lotus's programs. In any case, you may end up deciding to leave most of your old files as is, use the old programs to massage them, and convert them only when absolutely necessary. At that point, you might well be better off sticking with the old programs.

Know what you're likely to be in for when you make the switch, then pick the proper time to do it. The day before monthly reports are due or that you begin the last third of your novel is not the proper time.

And if you're considering a hardware change, consider this: Unless you've got a buyer chomping at the bit, the minutes you save with your new machine may never make up for the hours it can take to sell your old one.

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24-26

**Videotex '85** sponsored by Online Conferences, Inc. Conference and exhibition featuring videotex manufacturers and business and consumer applications. To be held at the New York Hilton in New York City. For more information, contact Online Conferences, 989 Avenue of the Americas, New York, NY 10018, (212) 279-8898.

## JULY

15-18

**The National Computer Conference** sponsored by AFIPS, Association for Computing Machinery, Data Processing Management Assoc., IEEE Computer Society, and Society for Computer Simulation. To be held at McCormick Place in Chicago, Ill. The theme for the conference is "Technology's Expanding Horizons." For registration and information, call (800) NCC-1985.

## AUGUST

19-20

**Future Computing's Graphics Forum and Seminar.** To be held at the Hyatt Regency Embarcadero in San Francisco. Overview and forecast of personal computer graphics marketplace. Contact: Future Computing, Inc., 8111 LBJ Fwy., Dallas, TX 75251, (214) 437-2400.

## SEPTEMBER

18-20

**UNIX EXPO.** To be held at the New York Hilton and Sheraton Centre Hotels in New York City. A UNIX operating system exposition for manufacturers, OEMs, VARs, ISOs, and end-users. Sponsored by National Exhibitions Co., Inc., 14 W. 40th St., New York, NY 10018, (212) 391-9111.

## OCTOBER

15-18

**COMDEX/Europe.** To be held at the RAI Congress and Exhibition Centre, Amsterdam, the Netherlands. Will feature hardware, software, peripherals, and other related items. Presented by The Interface Group, 300 First Ave., Needham, MA 02194, (617) 449-6600.

## 18-20

**Computers in Education.** To be held at the Sheraton Centre Hotel in New York City. Trade show devoted to education applications, hardware, and software. Contact: Conference Management, 17 Washington St., Norwalk, CT 06856-4990, (203) 852-0500.

# GRiD Makes Case With New Laptop

## FIRST LOOK

BY WINN L. ROSCH

Those familiar with the GRiD Compass, one of the first briefcase computers, will find the new GRiDCase familiar. It features the same black magnesium case designed to survive Federal Express shipping. 50 g's, or an attack by a pack of gorillas (all essentially the same thing), and it is finished in basic black with a flip-up display.

Once you do flip the display into view, however, you'll note a big difference—one that sets the top-of-the-line GRiDCase apart from other laptop computers. Its optional big, bright gas-plasma display not only makes all other portable screens look bad, it even looks better than a PC screen, with higher contrast, a sharper image, and a more pleasing red-orange color.

The display is 80 characters wide and 25 deep with a 1:1.4 aspect ratio (the 9.5-inch-diagonal screen is quite rectangular). An optional supplementary display font projects 132 characters across.

If the optional gas-plasma screen breaks new ground in portable displays, the GRiDCase's standard LCD screen shares the major fault of other laptops: a low-contrast image suitable for high ambient light conditions but inadequate in dim surroundings. As a compromise, an enhanced LCD display with a higher-contrast yellow background is available as a low-cost option.

## Power to the Portable

The LCD screens, however, have an advantage in battery life: 4 to 6 hours on the removable internal rechargeable nickel-cadmium battery pack versus 1 hour for the plasma display.

The brain of the GRiDCase is an 80C86 microprocessor, a low-power, CMOS version of the 8088's 16-bit big-brother

chip. That chip alone could give the GRiDCase a two-to-one speed advantage over the PC. An optional 8087 math coprocessor is available for even better performance.

Memory is dynamic CMOS (which is not conserved when the power is turned off) with 128K standard, expandable to a maximum of 512K.

The big difference between the GRiDCase and its Compass predecessor is PC compatibility. The GRiDCase is totally PC compatible—and not just with software. You can plug both a standard PC keyboard and an IBM RGB color display directly into the GRiD's jacks.

The GRiDCase will run all standard IBM software, although the built-in disk drive takes 720K 3½-inch hardshell (Mac-like) floppies. GRiD can supply over 100 best-selling programs (the list does not include Lotus's *1-2-3* or *Symphony*, however) on these disks, or you can add an optional external 5¼-inch floppy.

## Operating ROM

GRiD also distributes some software in ROM modules, including both PC-DOS and the GRiD operating systems.

The GRiD operating system is multitasking and can handle eight simultaneous chores. GRiD offers a full range of integrated applications that run under the system, all featuring a common user interface.

The GRiDCase keyboard has its own unique layout of 57 keys, although the alphabet is in the familiar QWERTY style.

The keyboard is a membrane mechanism, but it has full travel and tactile and audible feedback.

Both a parallel and serial interface are standard. Another 50-pin connector allows access to the PC bus so a PC-compatible expansion chassis can be added to the system.

Optionally, a 1,200/300 bps auto-dial/auto-answer modem can be installed in the GRiDCase. Other options allow customizing the GRiDCase to a variety of specialized applications, including an optional military Tempest rating, assuring that no radiation from the machine can be intercepted. A model meeting the COMSEC level of communications security is available to authorized government agencies.

The GRiDCase is meant to be part of an entire system. Consequently, it is designed to connect with GRiD's proprietary network, GRiD Server, which allows connection of several dozen GRiDCases and standard PCs in any combination and includes communal hard disks and printers.

**GRiDCase**  
GRiD Systems  
2535 Garcia Ave.  
Mountain View, CA  
94043  
(415) 961-4800  
List Prices: LCD (Model 1240), \$2,375; Enhanced LCD (Model 1250), \$2,550; Gas-Plasma (Model 1260), \$3,750.



# The Drive Warriors

Restoring order to the mass memory market



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Internal for Portable  
P-10e & P-20e  
10 & 20 Mbyte  
External series

of the mass memory market has become a casual battle scene! Chaos, confusion and buyer uncertainty have resulted from too many products and not enough answers.

The truth of the matter is, anyone can sell a Winchester disk drive. The problem is that hard drives, by their own nature, are sensitive devices that require appropriate handling and customer support.

Don't be misled into believing that a disk drive can be sold and booted around the country, without any risk.

There is no room for the weak, when it comes to delivering a product you can depend on!

Peachtree Technology Inc. has cleared the path of confusion with a comprehensive line of mass memory expansion systems that have established themselves as leaders in advanced hard drive technology, backed by strong customer support. Every Peachtree Technology Inc. product has been through stringent diagnostic testing as a complete system. To assure they not only meet, but surpass specifications. On the outside of every box is a documented certificate of inspection signed by our techni-

cian. Plus we stand behind our products with a complete one year parts & labor warranty.

**FLEXIBILITY AND COMPATIBILITY A MUST:** To eliminate frustration, Peachtree Technology Inc. has provided a complete line of mass memory storage systems. They are fully compatible with IBM PC, XT, & PORTABLE, AT&T, CORONA PORTABLE, COMPAQ DESK PRO & PORTABLE, COLUMBIA, TAVA, ZENITH 150 AND MANY MORE. If your computer is not listed, please contact us for further information.

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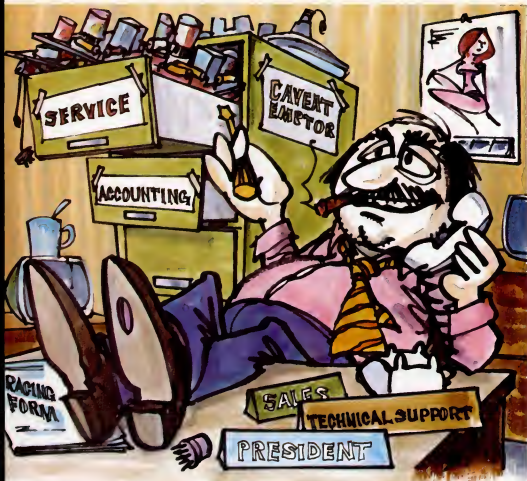
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1. Open the foldout page
2. Insert this sheet with
  1. Front side touching the free page
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3. Slice the folded edge
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DOWN TIME BY WINN L. ROSCH

# For Your Eyes Only: Monitoring PC Usage

Deteriorating vision is rarely heartwarming, particularly when news stories lead you to believe that an essential part of your profession—in my case, slaving away at a PC—can be the cause. Consequently, I have been avidly following the rharb about the effects of VDTs on various bodily functions.

If you haven't seen the reports—perhaps because you've already succumbed to retinal destruction from evil cathode rays—various concerned groups have pegged VDTs as a cause of cancer, birth defects, and even miscarriages. I can even offer good proof that such radiation causes baldness.

However, optical ailments are my biggest concern. No conclusive scientific proof exists for the claim that screen staring can cause myopia. Like acid rain, the subject requires further study—to allow enough delay so that we will all go blind and the point will become moot.

## A Pain in the Head

The case against VDTs as a cause of headaches is much stronger, and I have a first-hand understanding of the problem.

I've been looking into the VDT complaint and many of its supposed cures for quite a while and have discovered that no single solution exists, principally because the video screen throws several problems into our faces.

One big culprit is glare. With a glossy-faced video display—and that's exactly what IBM gives you with both its monochrome and color displays—you can see the whole world reflected in your screen and probably few of the glowing characters. You have to squint to read the screen and squint to fend off the bright reflections; consequently,

yoursquinting muscles (among others) get tired, and you get a headache.

A multitude of glare-reducing devices is available. The simplest—and to my eye, one of the most effective—consists of a fine black nylon mesh net, essentially a piece of panty hose, stretched across a plastic frame that fits directly in front of the screen of your monochrome monitor. My dealer sells one from Compu-Cable for about \$20. (This filter is not recommended for color monitors because the crosshatch of the netting and the shadow mask of color picture tubes creates an unsettling moiré effect.)

## Through a Net Darkly

The netting darkens the screen, enhancing contrast and making the displayed characters stand out, and the individual strands reflect little light, cutting glare. Although makers of other glare-reduction devices claim nets make on-screen characters fuzzier, to me, if there is a loss of sharpness, the other improvements make up for it.

Tinted and/or polarizing glass panels that fit over your display offer similar glare-reducing and contrast-enhancing effects and work with color screens. The one I've tried, the Hoechst Vu-Tek, works as advertised. It darkens the screen background and makes displayed characters stand out, although I find its "stickum" mounting scheme cheap and annoying.

The front of the Vu-Tek is coated to reduce glare, but it does not totally eliminate it. Similarly, it doesn't completely darken reflections from the tube surface. Properly designed polarizing filters can cut even the tube glare. Beware, however, when choosing

such screen shades. A few of them have inadequate anti-glare treatment on their own faces, so you risk substituting one source of glare for another.

## Occasionally Amber

Whenever the subject of screen colors comes up, I tiptoe out of the room to avoid the inevitable argument. According to what I've been able to gather, the best screen color is either green, amber, or black and white.

Mostly, I use an amber screen, but I'll leave the proselytizing to companies like Langley-St. Clair, which sells amber tubes to directly replace the green one in your IBM monochrome display. I haven't tried the conversion, so I can't recommend it. But I use an Amdek Video 310A monitor and find its amber more bearable than the ghostly lingering green of the official IBM display.

When I last visited my optometrist, I mentioned the head-



aches I got from working all day. He dug through a recently arrived parcel and pulled out new samples of tinted eyeglass lenses from Rooney Optical designed for those unfortunate like me who are unwillingly addicted to their computers.

In theory, you should get a special pair of spectacles reserved for screen watching that have these lenses. They are offered in three tints, each designed to increase the contrast of a particular monitor screen color—a violet tint for those with green screens, blue for amber viewers, and grey for black-and-white monitors. A special coating on the lenses reduces glare from the front and back surfaces of the lenses themselves as well as absorbing ultraviolet light, alleged to be one of the evil elements in computer's glow.

I found the green-screen glasses particularly pleasing because their violet tint makes colors under office fluorescent lighting appear more natural.

## Keep Your Distance

In my work, I've also discovered a few other ways of easing computer eye strain. I keep my monitor much farther away from my eyes than most folks—4 to 6 feet. When I begin to feel the strain of staring, I switch to my color screen at a different distance (even farther away). When one color scheme bothers me, I switch to another.

It's the fixed stare at the almost-unchanging screen that apparently does the most damage. Eye experts are now recommending that you occasionally pause from your work and concentrate on more distant subjects, giving you a medical excuse for staring out the window. I've found that they're right. ■

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# A Show of Hands (On)

Two new columns, Spreadsheet Clinic and Power User, will help you get the most out of your PC. We hope you'll send us enough tips to ensure that we never dig out from under the pile.

**B**ack in the forties a pair of reclusive brothers named Homer and Langley Collyer grabbed headlines when police pulled their rat-gnawed bodies out from under nearly 100 tons of newsprint and clutter stacked floor to ceiling in their Harlem home. A booby-trap had backfired and entombed them beneath an avalanche of paper; it took several weeks for the city's beleaguered sanitation men to sort out the chaos and cart it all away.

No matter how often I slog into my office with pitchfork, industrial-size trashcan, and good intentions, by the next day the place looks as if there could be a Collyer or two beneath the mounds of mail. As any micro user knows, computers don't reduce paperwork—they spawn it. We can all now generate 20 printed drafts of something in the time it used to take to type out just 1. Truly paperless offices are as much a fiction these days as software that doesn't require manuals.

Ring my desk are boxes brimming with disks and printouts. I spend a good part of each day yanking open jiffy bags, bubble-packs, disk mailers, Calumet cartons, and various homemade foil-and-cardboard envelopes containing submissions to *PC Magazine's* how-to columns. We pay \$50 for each User-to-User submission we print, plus an extra \$25 if it arrives via disk, MCI mail, or our Interactive Reader Service bulletin board. Most do. We wish they all did.

The best tips are the simplest: POKEs that perform programming magic, powerful, undocumented command

syntaxes, small assembly language or BASIC routines that can save time and trouble, hints on using DOS more sagely, or warnings about little-known computer bugs that eat files, destroy disks, or otherwise wreak havoc.



Paul Somerson

## Trend Setters

We recently spotted a new trend. Users are now stuffing our mailboxes with suggestions on how to use specific hardware and applications software more adroitly. A short time ago, we collected a small pile of 1-2-3, *SuperCalc*, and *Multimate* tips and published two columns we called "Spreadsheet Clinic," with a small note at the bottom of each asking readers to let us know whether they'd like to see more. The response was astonishing; the mail flooded in. As a result, we've decided to make Spreadsheet Clinic an ongoing feature.

In addition, with this issue we're rev-

ving up a brand new column we call "Power User." Power User will cover the hardware and nonspreadsheet software you use most—specific printers, modems, mice, word processors, databases, CAD packages, and more. Each issue will contain readers' hints, tips, and discoveries about particular products—Epson printers, NEC Spinwriters, *Microsoft Word*, Turbo Pascal, *dBASE II*, *ProKey*, *R-BASE* Hayes Smartmodems, you name it. It'll show you how to get the most horsepower out of your system with the least amount of frustration and wasted effort.

In the future, User-to-User will concentrate on DOS tips, BASIC programming tricks, and savvy computer use in general. Spreadsheet Clinic will focus on spreadsheets and integrated packages. And we'll dedicate Power User to the most popular hardware and software products—its product coverage will depend on the volume and quality of reader submissions. So if you've just figured out a sensational shortcut to make your printer purr, discovered how to soup up your word processor, learned how to turn your drab, monochrome database manager into living color, or stumbled on a way to make your keyboard macro program do something no one thought it could do, let Power User know about it. We'll pay you for your trouble—and make you temporarily famous.

## A Class Act

*PC Magazine* is a service publication. One of its primary functions is to help you figure out which of the hundreds of

## EDITOR'S SCREEN

similar-sounding products are best for you and tell you how best to use them. The goal of User-to-User, Spreadsheet Clinic, and Power User is to help you work smarter and more efficiently by

sharing the hands-on experience of sophisticated experts.

Ever since I was a kid I've heard wags say that humans actually use only a small fraction of their brains; we're all sup-

posed to be running on one or two cylinders. This same inefficiency is definitely true with the way we all use hardware and software. The refrain I hear most often whenever I demonstrate some awe-inspiring User-to-User insight to a visitor is "Gee, I didn't have any idea it could do that."

*PC Magazine* Editor Bill Machrone has recently been popularizing the remark "Computers are boring and stupid." One of the things I think he means is that while the hardware and software are capable of performing genuine magic, few users know how to really put it all through its paces. Software is stupid, and until designers engineer in some real programming smarts, it will stay that way. Much of the real power of these tools is inaccessible. Command jargon is invariably thorny and abstruse. Manuals are abominably written, dismally organized and indexed, and altogether vexing; users impatient to begin working often read just enough to fire up a program or a printer and then wing it. Powerful features are often poorly documented or are buried in prolix, somnolent boilerplate that makes IRS regulations seem like escapist summertime reading.

### At Your Service

We want *PC Magazine* to be the most powerful peripheral on your desk. And we're now dedicating more space to the tricks that can turn you into a real power user whether you're crunching numbers, maintaining personnel records, designing circuits, coaxing out lambent prose, sorting mailing lists, or using a PC to run a stamping press.

So flood us with submissions. Cast your disks upon the water. We want to make you look forward to every issue, and one way we hope to do this is by showing you how to work better—how to wring all the extra performance possible out of your systems. While we'll of course also serve up our nonpareil news, features, and columns, as well as our exhaustive and authoritative product reviews, *PC Magazine* will be focusing a bit more in the future on the hands-on magic that can save you time and trouble—and make computers your servants rather than the other way around. ■

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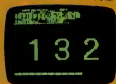
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CIRCLE 236 ON READER SERVICE CARD

# Letters to PC

## A Group of Chips

I would like to thank Winn Rosch for his timely "Down Time" column in PC News (PC, Volume 4 Number 9). For the past six months, I have been a frustrated user of the Mr. Chips board. My problem isn't as complex as trying to monitor a security system or interfacing with a thermonuclear reactor, yet I would be happy if the printing spooler was operational—it doesn't work at all. The message on the screen gives no hint if anything is wrong. In fact, it says "One file copied," but it doesn't tell you where the file is copied to. There is absolutely no output to the printer. Even the test file of the chipdisk does not work.

The people at Orange Micro have had some solutions to my problem, yet none of these solutions has been successful.

Perhaps the best thing to do is attempt to organize a Chips support group for Chips users and attempted users. Maybe we can give each other the support that Orange Micro cannot.

Michael J. Topper  
Pittsburgh, Pennsylvania

## Software Piracy Issues

Bruce Lewenstein confuses two subjects in "The Ethics of Software Piracy" (PC, Volume 4 Number 9). He treats both copying a software package and running a package on more than one machine as the same illegal act. They are really quite different.

In the article, he states, "Some people don't consider small-scale copying illegal. Just because the license says I can't use it on two machines doesn't mean that's enforceable. . . ." Legally, the copying may have little to do with using the software on two machines. These are two entirely different problems—the first governed by copyright laws, and the second by contract laws.

The copyright laws protect a published work, in this case, a piece of software. The laws protect the author from lost rev-

enue due to unauthorized duplication of the work. However, this has nothing to do with running a program on more than one machine.

The purchaser of a software package can take the master disk and run it on any machine in the world and not be in viola-



tion of copyright laws. He does not violate the law until he makes a copy of the program and runs one copy each on two different machines. The illegal act he has committed is making a copy and using it, not running it on two different machines.

Use of a single piece of software on multiple machines is controlled not by the copyright but by a license agreement that usually comes with the software. Software publishers use the license agreement as a contract between the publisher and the buyer, specifying the terms under which the software may be used.

It is time that computer users realize that running software on more than one machine does not, by itself, violate copyright laws.

Michael Perleberg  
Fairfax, Virginia

## Science and Technology Split

When we saw your essay "At PC, Data Is" (PC, Volume 4 Number 9), we hoped it would resolve one of our long-standing debates: whether *data* is plural or singular. Then, we got to your Ultimate Metaphor—and our debate rages anew. Indeed, your analogy is the best argument we have seen in some time for using *data are*. After all, *data* is not a

chunk, of salami or anything else; *data* are collected data points, each one a datum. And *data*—particularly digital *data*—do come in absolute units beyond which you can divide no further—the binary 1 or 0. So we are still arguing.

Ellen W. Chu (favors *data are*)  
Editor, *BioScience*  
Cary Lu (favors *data is*)  
Microcomputer Editor,  
*High Technology*  
Boston, Massachusetts

P.S. You would favor the "carefully applied generic *he*."

## Datum Ain't

*Data* is; *datum* was. One man's *data* is another man's *datum* (note the carefully applied use of the male gender). Without doubt, obfuscatory words, such as *datum*, deserve to depart the way of the dodo.

Woody Leonhard  
Pinecliffe, Colorado

## Datum Are

At PC Tech Journal, *datum are*. PC are wrong.

Will Fastie  
Marjory Spraycar  
Julie Anderson  
Jeff Duntemann  
Susan Holly  
Gail Shaffer  
Diana Carey  
Carole Autenzio  
PC Tech Journal  
Baltimore, Maryland

## Any Way You Slice It

Some ammunition in support of *data is*: (1) The fact that *datum/data* is not a word in Italian, French, or German indicates that it may not have been used as a noun in Roman times, at least not in its present sense. (*Datum* means merely "given.") Thus *data*, as an English coinage, may not be subject to Latin rules. (2) The Ox-

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## LETTERS TO PC

*ford English Dictionary* gives no historical quotations bearing on this point. (3) As Fowler's *Modern English Usage* notes, "Latin plurals sometimes become singular English words (e.g., *agenda*, *stamina*) and *data* is often so treated in the U.S." A similar foreign plural that has become an English collective singular is *salami*, the plural of the Italian *salame*, as was implicit in your "Analogy of the Salami." (4) *Datum* is almost as unnatural and pedantic as *salame* and is virtually never used. Even users of *data* are flinch from it, preferring something like *data item* or *observation*.

I congratulate PC for having the courage of its convictions on this issue. *Data* are is ghastly good taste and its haughty advocates are pharisaic pinky-lifters—smite them hip and thigh!

Roger Knights  
Seattle, Washington

### A Singular Obsession

I was appalled by Barry Owen defending his own and the editorial staff's honor when it was threatened by a nincompoop who criticized the use of *data* in singular form. Writing the flowery editorial extolling his virtues and those of Webster and antiquated Strunk, of all people, was a waste of paper.

Louis A. Warner  
Woodbridge, Connecticut

### One for the Books

I agree that *data* is, but who is this Webster you're quoting?

Michael A. Covington  
Advanced Computational  
Methods Center  
University of Georgia  
Athens, Georgia

*Not Daniel.—Ed.*

### Slice of Life

James Langdell presents a false analogy. His inability to subdivide *data* down to a *datum* does not demonstrate, as he claims, the dual role of *data* as singular and plural. Rather, it is a comment on his own insensitivity to the nuances of the language.

As evidence, I present my 3-year-old son, Benny Boy, who just the other day



adroitly identified a small shred of cheddar for what it is, a *chee*—obviously singular.

Robert F. Pierce  
Lake Charles, Louisiana

#### Slice of Pie

An editor's most embarrassing moment is a gaffe—use of the controversial *different* rather than the standard *different from*—in a piece on gaffes. There's no sin in growing fat on helpings of humble pie.

Ernie Schell  
Jenkintown, Pennsylvania

*Hold the pie. I'm still trying to swallow the salame and chee. —Ed.*

#### More Technical Columns, Please

I really like *PC Magazine's* increased emphasis on programming and other technical topics. I want to let you know that many of us have noticed and are gratified by this trend of articles.

I also have been enjoying Stephen Manes's somewhat offbeat articles in *PC News*.

David Casassa

#### Manes on a Roll

Stephen Manes's column in *PC News* is the first thing I turn to after I clear out all the little postcards and junk stuffed in between the pages of *PC*. While he's on a roll, keep him up front.

Philip Nanzetta  
Rockville, Maryland

#### Fighting the Fat Cats

I wholeheartedly disagree with the attempts of Lotus and others to close off mail-order and other discount channels for their products. I and many others are prepared to work at using our systems and, therefore, neither need nor wish to pay for the so-called support offered by authorized dealers. In many cases, the advice and support offered by the mail-order discounter is better than any advice available from local dealers. I have close to \$30,000 worth of computer hardware and software—all of which I bought through mail order. I have had virtually no problems at all, yet when I needed help, I got very good advice by phone.

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## LETTERS TO PC

Mail-order houses that are banding together to mount a legal battle against this unfair business practice should appeal to us, the computer-buying public, for support in fighting the fat cats.

Dan Moyer  
Ontario, Canada

### Turbo Power

Stephen Manes is right about the trade-offs between a product's features and portability on the one hand versus speed and size on the other ("Speed Drills: The Test for Power Programs," PC News, PC, Volume 4 Number 10). However, his statement that "compiling even a one-line Turbo Pascal program . . . will get you a file larger than 10K" is technically correct but terribly misleading. He has made Borland a victim of its own success. Due to an amazing feat of assembly language programming, the size of the entire Pascal library is 10K (compared to several hundred kilobytes for Microsoft Pascal). Borland was able to eliminate the usual tedious linking procedure and include the whole library in each .COM file. Programs can be developed with a speed that approaches BASIC but will execute with the speed expected from a compiled language.

Borland's success with Turbo Pascal and Sidekick is partially due to its willingness to buck the C tide and write compact assembly code.

Pulak Dutta  
Evanston, Illinois

### Stephen Manes replies:

*You're absolutely right, but no victimization was intended. I used Turbo Pascal as an example only because it compiles the tightest code I know.*

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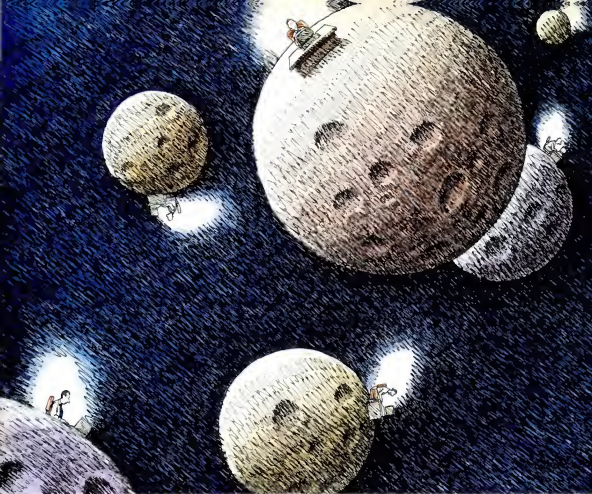
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# Breaking the Barrier

Norton predicts that DOS's 32-megabyte barrier will be broken by year-end—or sooner. To safeguard existing software, the approach will probably be to increase the number of sectors on a disk.

**A**lthough 32 megabytes is a lot of storage for most purposes, it isn't a very comfortable general limit on the size of disks that you can attach to your computer. After all, it's only three times the venerable old XT's 10-megabyte disk and a mere 50 percent more than the AT's standard 20-megabyte disk. In the last issue, I discussed the reasons behind DOS's 32-megabyte barrier (see "Reaching the 32-Megabyte Barrier," *PC*, Volume 4 Number 13). Now, I want to look at just how rigid the barrier is and discuss some of the ways that you can use to get around it. I will also address the pros and cons of some approaches that may break the barrier altogether.

## 32-Megabyte Partitions

The simplest and least disruptive way to get around the barrier is to divide a disk into partitions that aren't any larger than 32 megabytes each. DOS's 32-megabyte limit isn't an intrinsic limit on the disk itself, but on the part of the disk that DOS works with as a single unit.

For example, if you install a 52-megabyte disk in your computer, DOS can't take the whole 52 megabytes in one piece, but it can deal with it in two parts (see "Gang of Fourteen: Disk Types for the AT," *PC*, Volume 4 Number 12, for a discussion on the AT's built-in ability to accommodate 14 different hard disks, almost half of which are larger than 32 megabytes). For the first part, you use the FDISK utility to create a conventional DOS partition on the disk, of any size up to 32 megabytes. Now, you have a 52-

megabyte disk with a 32-megabyte standard DOS partition, leaving 20 megabytes hanging in thin air. What then? Because DOS can't get to that left-over 20 megabytes on its own, you have to install a device driver to handle the leftover



Peter Norton

as another partition so that DOS can access them through it.

From DOS's point of view, the 20-megabyte partition is a separate disk with its own drive letter. So, if the standard 32-megabyte DOS partition is drive C:, the 20-megabyte partition might appear to be the D: drive. Both drives are physically part of the same disk drive, but they logically act as if they were two separate disks—and DOS can handle that with no problem. All it takes is a small piece of software magic in the device driver.

I tried this kind of setup when I tested a 52-megabyte hard disk drive from Interface, and it worked fine. I used Inter-

face's drive because it was the first 52-megabyte disk that I found, but plenty of these jumbo disks and device drivers are currently available on the market.

## A Big Disadvantage

This partitioned-disk approach has one obvious disadvantage, however. It lets you work with bigger disks and increases your storage capacity more or less without limit, but at the cost of having these "small" disk partitions. For most situations, partitioning a big disk into several separate logical drives is only a small nuisance, but in some extreme cases, it's crippling. What do you do if you need a single disk file that's 40 megabytes in size? If you use a 52-megabyte disk and divide it into 32- and 20-megabyte partitions, you would have more than enough room for 40 megabytes of data, but you couldn't store it all in one file because a single file can't be spread across two logical drives. Of course, if you're contemplating that much data, you can probably find a practical way to divvy it up into several files. Nevertheless, you can also see that partitioning a disk just to get access to more storage space isn't an ideal solution.

## Major Obstacles

Other, cleaner approaches to the problem have been considered, but major obstacles stand in their paths. One such approach is to increase the size of the disk that DOS can handle. You'll recall that the 32-megabyte barrier exists because of the simple multiplication of two numbers: disk sectors are 512 bytes, or 1/2 K,

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and DOS keeps track of sectors with 16-bit numbers that range from 0 to 64K. In other words, DOS can only work with 64K separate 1/2 K sectors, which multiplies out to 32 megabytes. So, what if

you increase either one or both of those numbers? For instance, it seems logical that if you change the way DOS stores these numbers—say, increasing them to 24-bit or 32-bit integers—you would

vastly increase the number of sectors (and, as a result, the disk size) that DOS can handle. This solution seems to be just an internal matter for DOS, and if some of DOS's internal workings are restructured, then DOS should be able to handle big disks. Unfortunately, it's not easy to restructure an internal element of DOS.

#### The FAT Table

On the other hand, I have seen this sort of magic performed once before in conjunction with the introduction of DOS 3.0 and the AT's 20-megabyte disk. Another internal convention of DOS, the entries in the FAT table used to keep track of disk clusters, were changed from 12 bits to 16 bits. This change no doubt caused an internal revolution inside of DOS, but it also solved a problem similar to the one of increasing the number of sectors that DOS can handle.

Why can't this magic be performed again to increase the range of sector numbers beyond 64K? Unfortunately, while the FAT table was strictly an internal DOS matter that almost no other programs touched (my file recovery programs are a rare exception to this rule), the sector identification numbers aren't completely internal. They are visible to the outside world in a couple of ways, such as through official DOS services for those of your programs that use the standard 16-bit sector numbers. And if DOS were to switch to using a larger sector number, then a handful of major compatibility problems would probably arise. Programs that use these sector numbers may not be able to run with any version of DOS that uses bigger numbers. While not many programs do use these numbers, they are an official public part of DOS. Changing them would involve a formal break in upward compatibility from version to version of DOS.

#### Yet Another Possibility

Well then, what about changing the other number—the size of a sector in bytes? At first glance it appears that this is a much more flexible item. All disks can work with sectors two or even four times as big as the standard 512-byte, or 1/2K, sector size. And, thankfully, nothing in the definition of DOS's services



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implies a disk's underlying sector size. Therefore, it seems that there is no real obstacle to upping the sector size to increase the size of the disks with which DOS can work.

However, there's a really nasty snag: DOS isn't the only system that might be working with your disks. For example, you can partition hard disks to work with other operating systems, such as CP/M-86, the UCSD p-System, XENIX, PC-IX and other UNIX-type systems. It's one thing to introduce a new sector size and adapt DOS to it—but it's quite another to say that other systems would have to be changed, too. And you can't have part of a disk with one sector size and another part with another size.

#### Avoiding Lawsuits

You'd think that IBM could introduce a bigger sector size, have DOS adapted to it, and let the other systems go hang. But that's not the sort of thing IBM can do; its legal department would put the kibosh on that idea real quick. All large companies have to move gingerly in many ways to make sure that the activities of one division don't mess up the plans of another. For IBM, it's an especially big problem because the company likes to lead a clean existence, avoiding both criticism and lawsuits in advance.

Does that mean that you're completely stuck with 32-megabyte disks? Definitely not. First off, as I've been pointing out, you can always hang bigger disks on your machine, and you can use all the space too. As things stand now, you just can't use it in chunks bigger than 32 megabytes—not much to cry about there. Second, it's a pretty safe bet that technicians are currently working on DOS with hammer and tongs to break it out of this old 32-megabyte barrier. Personally, I predict that you'll see it this year, and it wouldn't surprise me a bit if it happened before this column gets into your hands. If it doesn't happen that soon, it will happen before too long. PCs simply have to have more disk storage.

Trying to predict technical advances (and IBM's strategic moves) is a chancy undertaking. But I'd say the most likely approach to break the 32-megabyte barrier

is to increase the allowed number of sectors on a disk—past 64K sectors—and not to increase the sector size past 512K. That approach will disturb the fewest existing programs. Ironically, I'll

be one of the software writers most affected—the current version of my programs can handle bigger sectors but not more sectors. So, if my prediction is correct, I've got some work to do. ■

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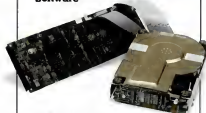
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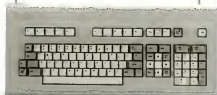
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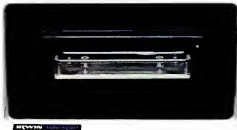
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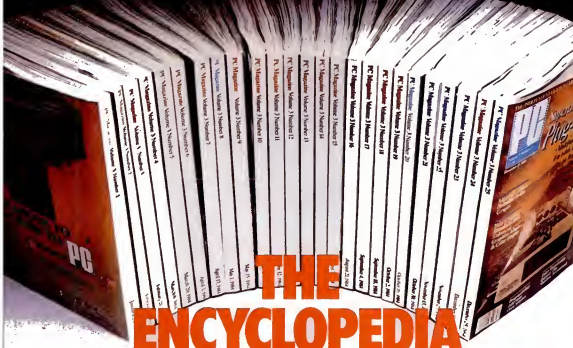
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ing data into your PC is a little pleasures. If you do it yourself, even for a highly skilled typist, if you have to pay someone to enter the text, you quickly find it takes both time and money—lots of money. The cost of entering data by hand continues to rise, even while the cost of storing and using that data declines dramatically.

One new technology to use OCR is the use of text, digitize them, and manipulate the digitized patterns into ASCII data that can be manipulated by almost any computer. In fact, OCR can be ten to twenty times faster than the human typist and more reliable.

On the high end of the market (833) are the high-speed proportional-spaced typesetters, magazines, and newspapers. Computer Products call the Intelligent Scanning System (ISS) is not just a scanner, it's a...







# PERIPHERAL VISION

## A GUIDE TO OPTICAL CHARACTER READERS

**O**ptical character readers can make your life much easier by reducing both typing time and costs. The current crop of machines offers a wide variety of capabilities and prices.

Entering data into your PC is not one of life's little pleasures. Even if you're a highly skilled typist, it takes time to type page after page of text. And if you have to pay someone to do the work, you quickly discover it takes both time and money—a lot of money. The cost of entering data by

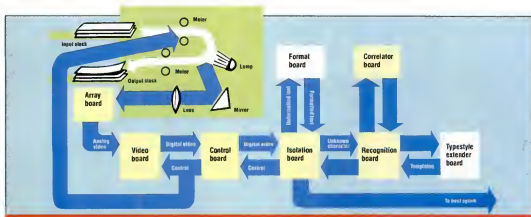
hand continues to rise, although the cost of electronically storing and using that data is dramatically declining.

One possible solution is optical character recognition technology. An optical character reader (OCR) with a PC interface can scan pages of text, digitize them, and

convert the digitized patterns into ASCII data that can be manipulated via software by almost any computer. An OCR can be 10 to 20 times faster than a typist and many times more reliable.

On the high end of the market is the Kurzweil 4000 (\$35,000), a sophisticated

Photograph: Steven Hest



**Figure 1:** Eight circuit boards operate the DEST OCR. Rollers feed paper into the system. Light is reflected off the page and off a mirror and passes through a lens, focusing the image into a photodiode array. This generates analog signals that are digitized into an array of pixels. Characters are recognized using templates for matrix matching. Character strings can be sent to the host system or to the text-formatting board.

OCR that can read proportionally spaced characters in books, magazines, and newspapers. Kurzweil Computer Products calls it an "intelligent scanning system," a claim that is not without merit. This system represents the state of the art in character recognition technology.

The midrange systems (\$6,000 to \$11,000) include DEST's Models 211, 212, and 213; TOTEC's TO-5000; and Hendrix's TR100. These optical character reader systems are designed for routine scanning of large amounts of typewritten text or typewriter-quality text. While these systems lack the sophistication of the Kurzweil 4000, they are responsible for the renewed interest in optical character recognition technology. They offer high performance at a reasonable price—a combination that until recently was impossible to achieve.

Oberon International has already gone well below the average \$8,000 price with its new Omni-Reader, a hand-operated OCR that sells for \$500. Despite the low price tag, the Omni-Reader includes the same basic features that are found in the more expensive models.

#### OCR History

The human eye has always been the model for optical character recognition technology. When you read, your eyes

scan a line of text; the lens focuses the light on the retina; and the retina then "digitizes" the image and transmits it to the brain. In fact, many of the early developments in optical character recognition stemmed from efforts to build reading aids for blind and visually impaired people. One of the first patents on record for a reading machine for the blind is dated 1809.

OCRs have been under research and development for over 100 years by various individual scientists. C.R. Carey of Boston, Massachusetts, developed the first retina scanner in 1870, using a mosaic of photocells to scan characters; P. Nipkow of Poland developed a scanning disk in 1890 that was a forerunner of modern television cameras; Emmanuel Goldberg of Chicago converted scanned text into Morse code; and others added to or refined the technology.

In the early 1950s, the widely publicized work of Mark Sheppard, the inventor of GISMO... A Robot Reader-Writer, generated widespread interest in optical character recognition. In 1954, Jacob Rabinow developed a prototype machine that was able to read uppercase typewriter output at the "fantastic" speed of one character per minute. Many large companies, including IBM and Bell Laboratories, also worked on optical character recognition

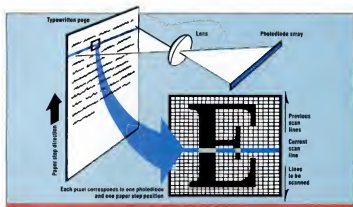
techniques during this period.

Sheppard and Rabinow both went on to start their own companies and were instrumental in developing optical character recognition tools for the government, banks, and publishers. During the late 1960s, the technology underwent many dramatic developments, but for the most part OCRs were still considered exotic and futuristic. Systems that cost millions of dollars were not uncommon, and even relatively low-priced systems (\$50,000) did not become commonplace in the business office until this decade, when the widespread use of personal computers dramatically changed the role of OCRs.

#### Futuristic Type

Long before the birth of the personal computer, however, optical character recognition helped shape the public's perception of computers in general. In 1956, the American Banker's Association standardized a font of characters called the Magnetic Ink Character Recognition (MICR) type that appears on all personal checks. This now-familiar typeface came to represent "computerization" in the 1960s and is even used today when a futuristic type style is appropriate.

MICR type was designed for applications that require high-speed reading. Blobs of ink help the character reader dis-



**Figure 2:** Here's an example of OCR scanning. A 2048-element linear photodiode array detects light from a line 1 pixel high, with each pixel representing an area on the page of 0.00016 square inch. Each text character occupies a 24- by 32-pixel frame.

tinguish between characters that appear similar, such as the number one (1), lower case *l*, and upper case *I*, and reduce possible errors resulting from dirt or forgery. Retailers adopted a similar nonmagnetic font during the same period.

Some of the early OCRs could only read special typefaces, such as MICR. The IBM Selectric and other similar typewriters could not create these characters, and the human eye struggled to read them. As a result, many manufacturers developed their own optical character recognition fonts; that is, until the American National Standards Institute adopted a font standard, called the USASI-A (OCR-A), in 1966. A second standard font, OCR-B, was developed in Europe, and today both fonts are widely used on all OCRs. In the 1970s, OCR developers perfected the omnifont ability, and, as a result, the machines can now read standard typewriter characters.

#### Supermarket Readers

In the late 1970s, the public became more aware of OCRs through the popularity of a simple, inexpensive optical character recognition device, called a bar code reader, that was widely used in supermarkets. A light-sensitive wand or a built-in scanner reads an alternating field of black-and-white bands; the various widths of

each band may represent such information as an item's name, price, and stock number. The bar code reader processes this data right at the supermarket checkout lane for your receipt as well as for inventory records.

Bar code technology reads only one dimension: width. The height of the bands allow the bar code reader to scan the code accurately without having to hold a package in any special position. These alternating widths can also represent other kinds of data as well. Bar code values can be programmed as necessary to represent different data values.

OCRs that read characters from a printed page and bar code readers both use a light-sensitive scanner on alternating light and dark areas—but the resemblance stops there. In addition to using a more sophisticated technique for scanning, a character-reading machine must also read two dimensions: width and height. Figure 1 illustrates how one type of OCR, the DEST, works.

Most OCRs use a matrix of photodiodes to scan a page that has been illuminated with a light source from within the system. Depending on the type of machine, the scanning system may read the contents of an entire page in one pass or scan each page line by line. The light reflected by the white page generates voltage in the photo-

**T**he human eye has always been the model for optical character recognition technology. When you read, your eyes scan a line of text; the lens focuses the light on the retina, and the retina then "digitizes" the image and transmits it to the brain.

diodes, but the light absorbed by the darker areas, or characters, doesn't generate any voltage. This combination of on-off voltage levels creates an analog data pattern (see Figure 2).

The OCR takes the analog pattern and digitizes it into a matrix of binary data. It then checks this data table, which is stored in RAM, against a table of characters that is stored in PROMs. The reader compares the scanned data against its set of characters and converts successful character matches into ASCII format.

#### Template Matching

OCRs use one of two methods to compare and match characters: template matching, which is the most-common, and pattern recognition, a relatively new process.

Template matching, as its name implies, compares scanned data against a standard character template. Digital templates for various typefaces, like Courier and Prestige, are stored in PROMs on the OCR and can be changed depending on the typeface of the material currently being scanned. Most template-matching systems do not have to use a full 24- by 32-pixel frame to make a satisfactory match. In fact, most characters can be matched using only half or less of the template's digital information.



Scanned characters may go through the table in a loop several times until the reader finds a successful match. The process of matching characters within the loop is accelerated by repeating the most common letters, such as *e*, *s*, and *t*, over and over in the table. If a match cannot be found within the loop, the OCR may tilt characters in the table and run the loop again. Some systems run characters through a digital filter to clean up the copy and then try to match them again. When every other attempt at reading the character fails, the system alerts the operator so that he or she can enter the character manually.

#### A Step Beyond

Pattern recognition goes a step or two beyond template matching. Instead of looking for an exact match against a template master, the reader scans the shape of characters and compares them against a shape table. For instance, if the reader scans a vertical bar followed by a semicircle attached halfway down, a pattern-recognition algorithm determines that the bar and semicircle describe the letter *b*. A circle followed by a bar would be read as the letter *d*.

Pattern recognition offers a considerable advantage in flexibility over template matching because the shape tables can be instructed to read a variety of type styles. One of the big advantages to this method is that the OCR can read proportional print. Most OCRs use a fixed character frame

that approximates monospacing on typewriters (10 pitch, for example, means that all the characters take up 1/10 inch). Proportionally spaced characters found in books confound these machines because the letter *i* may be only 1/3 as wide as the letter *n*. Template-matching systems cannot read italic and boldface type or other variations.

Another advantage to pattern recognition is that a reader can "learn" a typeface, including italic and boldface characters. An operator starts the process by feeding the proper font information to the shape table and then, in most cases runs a series of scans to teach the specific patterns unique to that typeface to the machine. As the machine learns the typeface, operator intervention decreases.

The algorithms used in shape tables require exceptional resolution on the part of the scanner and considerable computing resources. For example, the Kurzweil 4000 requires minicomputer power and memory in megabytes—hardly a desktop machine that you'd use to scan a business letter.

#### Future Developments

The next big development in optical character recognition technology—the ability to read handwritten text—already exists. The Internal Revenue Service uses OCRs to scan handwritten tax forms, and several other government agencies have similar systems.



In the late 1970s, the public became more aware of OCRs through the popularity of an optical character recognition device called a bar code reader that was widely used in supermarkets.

Several companies are currently attempting to develop machines similar to the Kurzweil 4000. Although many machines can read typewritten text, true proportional text recognition will probably remain the domain of the Kurzweil 4000 for the next few years. But as both optical and digital technologies develop, a desktop scanner may be able to read a book by the end of this decade.

The OCR hardware is only part of the problem for the delay. Developing template-matching and pattern recognition software that quickly makes a match is where most of the work remains to be done. Artificial intelligence techniques have been suggested, but most are still under development. The most likely integration of artificial intelligence will be in the field of expert systems; specialized software will be trained on a variety of specific typefaces and will learn to recognize a letter without having to know which typeface is being used.

OCRs with pattern recognition abilities may hit the market sooner than expected. Once OCRs are able to scan books and convert the text to data at high speeds, the process of amassing a huge database can begin. In fact, OCRs may hold the key to the ultimate success of artificial intelligence software—by becoming the eyes of the computer. ■

*Tom Stanton, a freelance writer, resides in Manchester, New Hampshire.*

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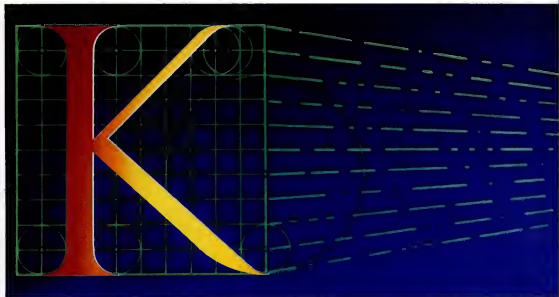
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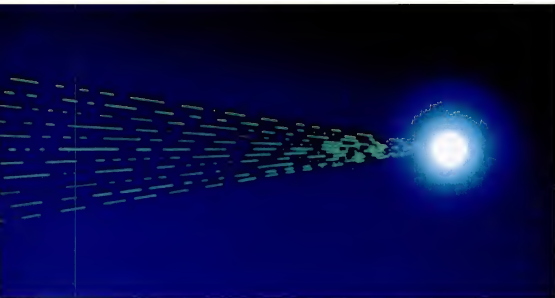
# THE KURZWEIL 4000

## A STATE-OF-THE-ART READER

**T**he Kurzweil 4000 takes template-matching OCR technology another step into the future. Not only does it gobble up printed words quickly and effortlessly, it can also learn to recognize and digest unfamiliar type fonts.

Down the street from Kurzweil Computer Products in Cambridge, Massachusetts, is the Fusion Lab of MIT. Across the street are still more labs. In this neighborhood of invention, Kurzweil Computer Products can hold its own. This company's Kurzweil 4000 scanner, is widely recognized as the state of the art in character recognition technology. The scanner's unique shape recognition system, which allows the optical character reader (OCR) to "learn" new characters and type fonts, can read practically any book, magazine, or newspaper.

The Kurzweil 4000's inventor, Raymond Kurzweil, studied artificial intelligence down the street at MIT. After graduating, he founded Kurzweil Computer Products. The company's other products include the Reading Machine, which was introduced in 1976 to aid blind people by scanning a page of text and then reading it aloud. Musician Stevie Wonder owns two of them. A commercial OCR followed in 1978. Most recently, Kurzweil developed the Kurzweil 250, a keyboard synthesizer, and is currently developing a voice-actuated typewriter. In fact, many of the company's products seem to offer some help to the handicapped. But if the help you need is in converting a huge mass of printed text into convenient magnetic form, then the



Kurzweil 4000 Scanner may interest you.

### Pushing the Limits

The Kurzweil 4000 provides some innovative solutions to the limitations of OCR template-matching systems. Many current OCRs that use a template-matching system are limited to monospace scanning; they are unable to read proportionally spaced characters. Most OCRs of this type read typefaces, not characters; for these OCRs, an A in any typeface other than the appointed one cannot be read. Finally, some OCRs can only read special typefaces like OCR-A or OCR-B.

The 4000 overcomes these limitations by using a new shape-recognition system.

Instead of matching pixel patterns for a specific typeface, the Kurzweil 4000 compares scanned characters against a shape table that contains the essential features of most letters. Kurzweil calls this process intelligent character recognition, or ICR. The Kurzweil 4000 "feels" letters digitally by examining groups of pixels and looking for concavity, loops, and horizontal lines that determine a character's shape.

Shape recognition, as a mechanical process, most closely approximates human reading. People don't read typefaces: They read letter forms. People don't differentiate between a Times Roman A, a

Century Schoolbook A, or a Courier 10 A. They only read A, unless they are admiring the typeface.

Since the Kurzweil 4000 scans and matches letter shapes instead of specific type styles, in theory, it should automatically read any type font. In practice, it cannot—type-style variations effect shape recognition. Even with extensive artificial intelligence capabilities, the 4000 still faces some formidable obstacles in scanning typeset copy.

### Technical Difficulties

To your eyes, most letters change only slightly from one typeface to another. It takes a trained typographer to look at a letter and identify the typeface. In most cases, readers are indifferent to the subtleties of typeface design except when they disturb their reading.

The Kurzweil 4000 cannot ignore details so easily. The scanning system is so precise that it sees and must interpret all the subtle variations in a character's shape. Some typefaces use wider strokes on vertical lines than on horizontal lines. Round shapes can be tilted slightly or made more elliptical. Serifs and decorative flourishes (called *swashes*) can confound the shape recognition process. Type designers often embellish lowercase letters like *a*, *g*, *s*, *f*,

and *y* with distinctive stylistic touches peculiar to one type design alone. Accents and diacritical marks in foreign-language typefaces add to this problem. All these variables make the job of shape recognition even more complex.

However, the biggest shape recognition challenge comes from kerning and ligatures used in typesetting. Kerning pairs certain letters together to improve spacing and readability. For example, the letter *T* has a wide space beneath its crossbar that leaves a big hole in typeset text. Typographers like to tuck lowercase letters like *a*, *e*, *i*, and *o* beneath this crossbar to improve the text's appearance.

Kerning letters is optional, but ligatures are groups of characters that have been kerned permanently. Common ligatures are *ff*, *ffi*, and similar groupings of narrow letters held over from the days of metal type, when kerning was so difficult that these groups of letters were printed together on one piece of type. Even today, when ligatures and kerned pairs can be created electronically, these forced groups remain a part of nearly every type font.

Most OCRs cannot split kems or ligatures. They must either incorporate these character groups into the recognition scheme or reject them. Kerns are very common today, and it would require ex-



tensive memory just to store the most commonly kerned pairs and possible ligatures. Even if there were such a capability, there would still be problems since each type font uses its own style for ligatures and its own spacing for kerns.

The Kurzweil 4000 overcomes these rather formidable difficulties by storing variations in characters in its document scanning file. When the 4000 encounters a character it does not understand, it alerts its operator and asks for assistance. The operator then tells the system what the character should be, and the scanner stores the information for later use. The operator is not just helping the Kurzweil read the character: the identification of that character is stored with the shape. Whenever the 4000 encounters that character again, it can recall the operator's response. Once the scanner knows a character, it becomes a part of the document file structure.

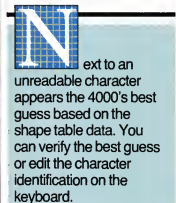
#### Learning to Read

Teaching the Kurzweil 4000 is simple. In its training mode, the 4000 relies entirely on its own shape tables to match characters. When scanning the first few lines of text, the machine stops often to ask for identification of unknown characters. Variations in character shapes from print quality, reproduction quality, or from an unusual typestyle can prompt the system to question characters more often.

During the scanning process, the screen shows eight lines of scanned text on the bottom of the screen and displays a large enough image of the current shape being scanned so that you can see each pixel used in the construction of the image. With some photocopies, the scanner actually displays minute toner dots as single pixels on this display. Next to an unrecognized or unreadable character appears the system's best guess based on the shape table data. You can verify the best guess or edit the character identification on the keyboard.

If you correct the machine's best guess, your response is stored as part of the shape recognition data for the document. As scanning continues, the machine builds up data for recognizing kerned pairs, ligatures, letter spacing, flourishes, and accents. Each variation increases the system's ability to recognize a wider range of differences within the document.

Because of this extensive training process, the Kurzweil scanner probably would not perform well in an office that scans one or two pages per document. It would be faster to retype the document in or use a desktop scanner. However, the machine shines in scanning long documents. Let's say you want to scan a tele-



phone directory. At first, you will have to work with the scanner as it studies the shapes of the new characters. Telephone directories use compressed characters, usually boldfacing, and regular face, and the Kurzweil must read this information into its shape tables.

Once you are satisfied with the 4000's ability to read the document, you can switch to the production mode. If the system requires help (information) reading broken or smudged characters, it stores the help as well. When it encounters more bad characters, it possesses additional shape information to check them against. This information is stored with the document file. If you go back to scan the telephone directory again, all the previous information used to train the scanner is recalled. Additional intervention is minimized, and you can start scanning right away in the production mode.

#### Under the Hood

The basic Kurzweil 4000 configuration includes an operator's terminal and a workstation that isn't much bigger than a

two-drawer file cabinet. The workstation houses a 384K CPU, a 10-megabyte hard disk, a 5 $\frac{1}{4}$ -inch floppy drive, a power supply, an asynchronous communications port, and the scanning subsystem. The dedicated operator's terminal has a detachable keyboard and an adjustable screen. Options include an automatic sheet-feed mechanism, a 9-track tape drive, additional asynchronous ports, and a bisynchronous port.

In addition, optional electronic tablets can be used to prepare multicolumn documents for scanning: A stylus marks the top and bottom scanning boundaries, and the Kurzweil uses these dimensions to size up a single column before scanning it. This feature also makes selective scanning possible, since the stylus can mark any start/stop region within the tablet. This boundary creation makes entering text that is peppered with graphics much simpler.

The basic configuration costs \$36,500, and a fully loaded system with most of the options can run as high as \$65,000 or more. With a system like this, a PC becomes more of a peripheral than a central processor. When a Kurzweil 4000 is hooked up to a personal computer, the PC is usually part of a local area network or used to offload work from a mainframe.

The 4000 can output to either an asynchronous or bisynchronous communications port. Text files can be run through a format processor that sends system-specific formatting codes along with the text to a host system. The scanner has output format processing for IBM, Wang, and Xerox computer systems, and for the Penta and Quadex typesetting systems.

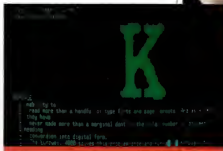
After start-up diagnostics are run, a menu appears with selections for file maintenance, communications settings, and operator modes. The 11-by-14-inch scanning area is covered with a rubber door, just like a photocopy. There's a sloped edge to accommodate book bindings during a scan.

The scanning head consists of a lens-and-photodiode assembly mounted on two rods that move at right angles beneath the scanning area. The head's resolution is 364 x 670 pixels per inch. Light from the page is focused by the lens onto the photodiodes, which, in turn, send signals to the CPU for processing. The multiple-focus lens can compensate for page and type



quality. Thick, blotchy printing can be honed down by allowing more light to come through the lens, slightly overexposing the page and burning the edges off of letters. With thin, broken printing, less light comes through, and the photodiodes pick up more details. As with most OCRs, copy quality determines the efficiency of the scan, but the Kurzweil 4000 is efficient over a broader range of copy.

Page position is not critical because the



scanning head senses the dimensions of a page during a preliminary scan that also tightens the head scan action. This tightening reduces time wasted scanning the entire surface. After breaking up characters into a matrix of voltage impulses from photodiodes, the signals are digitized and sent to the shape recognition software.

#### In Action

Noel Coletti, Kurzweil's corporate marketing manager, scanned some samples on the 4000 to show the OCR in action. Unlike desktop scanners, the Kurzweil 4000 read each of two typewritten samples in unforgiving detail. In fact, the scanner actually detected a smattering of ink dots one-third the size of periods that came from the fabric of the ink ribbon.

A third, typeset sample was a single column of photocopied type. Many of the characters had been run together because the toner filled in the white areas between letters. Other characters were broken. As with most photocopies, some areas were darker than others, and the density of each character varied tremendously. Even if template-matching systems could read this typeface, there would be many rejected characters because of poor copy quality.

Coletti put the sample down on the



Above: The Kurzweil 4000, complete with operator terminal and processing unit. Inset left: Broken or irregular characters are highlighted on the screen.

4000, and the scanning head located the type boundaries. The machine started scanning and sending character shapes to the software for recognition. It matched a number of them right away. The first unknown character shape appeared on screen with the system's best guess displayed next to it. Coletti explained how to accept or edit a character and demonstrated how to compensate for the bad copy quality by opening up the lens to burn out the extraneous dots on the page. The reading went slowly at first, as the system choked on many broken, joined, and faded characters. On the expanded scale of the screen, the letters looked like bombed-out buildings with splashes of toner drifting within

the frame and, occasionally, with an attached tail-end of another letter, an unintentional ligature that was dutifully integrated as a potential shape by the scanner.

As it continued to scan, the 4000 stopped fewer and fewer times. At the end, Coletti rescanned the sample using the information the OCR had culled from the first read. The new scan went rapidly, with only a few interruptions for questionable characters.

Once a document has passed the training mode, you switch to the production mode, where the Kurzweil 4000 uses the new information on the document's characters to scan them and output ASCII text. Scanning speeds are slower than template-

matching systems—30 characters per second is the average—but considering the various types of documents it can scan, that speed is remarkable.

#### High-Pace Markets

At \$36,500 and up, the Kurzweil 4000 is not within everyone's price range, yet typical customers are not limited to the Fortune 100.

The legal market is a natural for the Kurzweil scanner. The machine has been so successful that Coletti says, "If you hear of a major corporate lawsuit, chances are good there's a Kurzweil 4000 somewhere in the process." Many law firms use the system to scan briefs, depositions, books, journals, and other printed matter related to a case. They use it not only for its versatility, but for its speed: The 4000 can transcribe text from any document quickly and accurately and generate ASCII text files at the same time. In cases where there are mountains of text to transcribe, this kind of speedy turnaround is a distinct advantage.

The Mead Corporation uses a Kurzweil 4000 on its LEXIS legal database. The 4000 scans information from documents like newspapers, books, legal journals, and typewritten briefs and puts it on LEXIS in a short period of time (the full text of a Supreme Court decision goes on-line within 72 hours).

Publishing is yet another potential market, and one recent archiving problem exemplifies the flexibility of the Kurzweil scanner. Chemical Abstract Services (CAS), publishers of *Chemical Abstracts*, studied the problem of adding older printed information from its indexes to an electronic database.

*Chemical Abstracts* has been published since 1907, and a great deal of its printed matter includes chemical formulas with subscripts, superscripts, arrows, and scientific symbols, all printed in 6-point type using both regular and boldface text, with even smaller type for sub- and superscript characters. The printed indexes for *Chemical Abstracts* from 1977 through 1981 alone are 131,000 pages long.

Keyboard data-entry services only promised CAS 93 percent accuracy, which was far below its requirements. CAS then turned to OCRs and tested the Kurzweil

4000. Although it scanned the pages fairly well, it had difficulty with the small sub- and superscript typefaces (6-point type is the smallest size a 4000 can scan). The odd character spacing employed in the text also affected the throughput speed. After several tests, CAS found that a Canon 400F photocopier, enlarging the text by 127 percent, improved the scanning throughput on the 4000, and, after further testing, the 4000 was finally selected by CAS for the conversion project. According to its own studies, CAS estimated a 66 percent savings in throughput time using the Kurzweil scanner instead of keyboard data entry.

Many media conversion houses offer Kurzweil 4000 conversion of printed pages into magnetic data. You can check your Yellow Pages to see if your local data entry or media conversion houses offer OCR text processing. Don't be surprised if they use a Kurzweil. In fact, Kurzweil service bureaus exist in many cities.

With its remarkable, "teachable"

shape recognition system and its speedy reading times, the Kurzweil 4000 scanner may be just the ticket for eating through reams and reams of typeset information and digesting it digitally.

#### PC FACT FILE

##### Kurzweil 4000 Intelligent Scanning System

Kurzweil Computer Products Inc.

185 Albany St.

Cambridge, MA 02139

(617) 864-4700

List Price: \$36,500

Includes: 384K processor, operator terminal, 10-megabyte Winchester disk drive, 5 $\frac{1}{4}$ -inch floppy disk drive, asynchronous communications port, general-purpose text-formatting interface, 33,000-word lexicon, 90-day warranty, 2 days of training in Cambridge, 2 sets of documentation.

CIRCLE 691 ON READER SERVICE CARD



The price of the 4000 includes 2 days of training at Kurzweil's headquarters.

# How to make the world's greatest impression. Just \$399.



**Write!** A person can move nations with a well presented idea.

The word processor is mightier than the sword, but only as sharp as its printer.

Daisy wheel printers produce strong, rich impressions. Impressions a dot matrix printer cannot make.

And now price is no longer an obstacle to the Write Impression. The Alphapro 101 prints letter quality for \$399.

The Alphapro 101 is a 20 character

per second, letter quality, daisy wheel printer—No other high performance letter quality printer can match our price. Compare the Alphapro 101 and see. Its solid craftsmanship and one-year warranty make it the most reliable buy in its price range. And it's compatible with all popular microcomputers: IBM® PC, PCjr, XT, AT;™ Apple® IIe, IIc, and Macintosh.™

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crisp, to-the-point type.

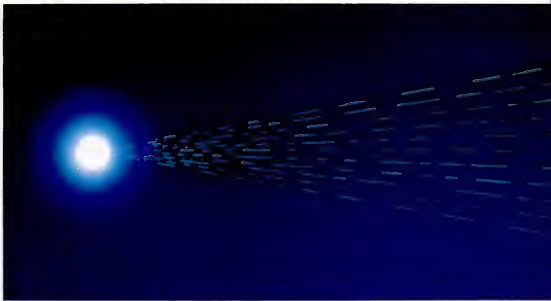
So don't wait. See your local Alphacom dealer and make the Write Impression on the world today.

For the Alphacom dealer in your area, call Alphacom direct, **408-559-8000.**

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## **Alphacom**

**THE WRITE IMPRESSION.**



## MID-RANGE OCRs

### RELIABLE AND REASONABLY PRICED

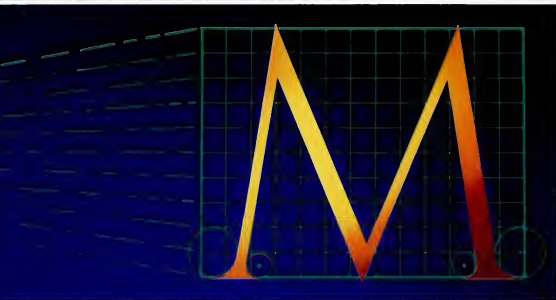
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**A**lthough they can read only certain typefaces, mid-range optical character readers are an affordable and efficient option for companies with well-defined applications.

The ultimate aim of the new desktop optical character readers is to make optical character recognition a commonplace. The best of these machines are compact, efficient, reliable, and inconspicuous. They cloak their operations beneath beige exteriors that make them look no more complex than an average photocopier, and they are nearly as easy to operate: A stack of sheets is placed in one bin, a button is pushed, characters scroll by on the screen, disk drives whirl and whisper, and the sheets are stacked on a bin below.

DEST Corporation's Models 211 and 212, TOTEC's TO-5000, and Hendrix's TR100 all fall into the middle of the OCR spectrum, ranging in price from about \$6,000 to \$11,000. These desktop OCR systems are designed for routine scanning of typewritten text or letter-quality printing and can handle fairly large amounts of text. (Most systems average 120 pages per hour.) Although they lack the power of larger OCR systems to read proportional text, their high scanning speeds and relatively low price tags represent a major breakthrough in automated data entry.

All these OCRs work more or less the same way: A page is fed into the system, characters are digitized, then each character is compared against a table of known characters in the OCR's memory. Each



successful match generates an ASCII character, which is sent to the host system. Most commercial OCR systems use this method, called template matching.

Digitizing a page of type is often more difficult than digitizing a picture. Line drawings and photographs can be digitized in fairly large swatches, and as long as the basic image is transmitted correctly, the tolerance for shading of gray areas is fairly wide. Digitized graphics do not have to match another digitized image; they are original images, transmitted "as is" and corrected as necessary on the host system.

A page of type has no gray areas, only black and white. Instead of digitizing a wide area, OCRs must focus on a single,  $\frac{1}{6}$ -inch-high line of characters. Once digitized, each character must be isolated and compared against a character template for a match. Any approximation usually results in an incorrect character transmission to the host. Since more than 1,000 characters appear on a page, the tolerance for error must be very low (the industry standard is 1 in 300,000).

Each character is digitized into a fixed-pixel frame, much like the character matrix found on a printer or video monitor. But while the IBM-PC monochrome monitor resolves each character into a  $9 \times 13$  pixel frame, OCRs use a frame with twice

the resolution, typically  $24 \times 32$  pixels per frame. Since OCRs use fixed-pixel frames, character reading is monospaced. Template-matching systems cannot read true proportionally spaced characters and script, italic, and most boldface types. As a result, most OCRs cannot read books, newspapers, or similar typeset material.

Although OCRs scan one line at a time, most template matching is done one character at a time. Each digitized character is isolated and checked against the character templates stored in a PROM on the OCR. The character templates use the same pixel frame as the scanned characters and compare pixel positions in each frame to establish a match. Most OCRs need only compare part of the character before deciding that a match has been made.

Depending on the complexity of the system, the operator may be alerted when a single character is unreadable or only if a certain percentage of a page is considered unreadable. OCRs can store several templates on line, although most cannot check more than one typeface per line at once.

Successful character matches are converted into ASCII text code that can be transferred to a host computer system. Many OCRs can also transmit such formatting codes as underlining, indents, tabs, paragraph markers, and returns. The

most common data transmission format is asynchronous serial, using an RS-232 port, although most models offer bisynchronous transmission as well.

Although the midpriced OCRs have much in common, they have a number of differences. Before buying, you should know what typefaces an OCR can read and test it with the typefaces most often used in your office. For example, most OCRs claim to read the common Courier 10 face, which sounds great until you realize that there are almost as many versions of Courier 10 as there are printer and typewriter manufacturers. Since typefaces are never generic, you should test real-world samples on an OCR instead of using a demo specially prepared by the manufacturer. Under ideal conditions, all OCRs perform extraordinarily well; under day-to-day office conditions, they may not work as well.

Surprisingly, most OCRs cannot read dot matrix print. The dots used to create the printed characters produce a fuzzy image that most systems cannot successfully digitize. Nor can they read poor photocopies and originals. Clogged type, in which the inner spaces of a letter are filled, is also unreadable. Some OCRs will reject pages with too many corrections scrawled on them; others will simply skip over the unreadable characters.

## MID-RANGE OCRs

OCRs can scan only visible ASCII characters. No readable formatting codes for text, such as indents, tabs, line endings, word wraps, and paragraph markers, exist on the page. OCRs can interpret white spaces and generate default codes, but the results are unsatisfactory. For example, if an OCR generates a carriage return for all line endings, reformatting will be a chore; you must go to the trouble of editing out carriage returns and replacing them with word-wraps or "soft returns." Reformatting tables and columnar matter can entail even more work.

A partial solution for owners of dedicated word processing systems is using a format-processing PROM containing system-specific format codes. But these can cost over \$1,000—assuming the OCR manufacturer makes PROMs for your system's software—and if you communicate with more than one dedicated system, you need more than one PROM. Most manufacturers do not even offer format processors for the PC, which would require different ones for each program.

These machines' manufacturers, to their credit, are careful never to make exaggerated claims about their systems' capabilities. Since OCRs are just now coming into vogue, they start out with a large amount of goodwill from consumers and critics. Their manufacturers seem painfully aware of this fact and unwilling to squander that goodwill in the name of the bottom line. They recognize that their products will be used by inexperienced operators in a diverse market, where one or two service calls can be grounds for divorce.—Tom Stanton

### DEST 211

Like many writers, I have hundreds of pages of precomputer-typed manuscripts sitting in file drawers waiting to step into the 21st century. When I found out that the DEST WorkLess Station, Model 211, OCR was on its way, I wasted no time hauling out all those old files and arranging them in order of importance, with my own attempt at the Great American Novel right on top.

The DEST 211 arrived a day later, outfitted with the TypePak 2 PROM, which allows it to read three type styles: Courier



WorkLess Station, Model 211

10, Prestige Elite, and Letter Gothic. Since my novel was written on an old Olympia with Modern Congress Pica type, the DEST could not scan it. (I doubt any other OCR, save the Kurzweil, could either; the novel will have to wait.)

With only slight disappointment, I gathered some samples printed with Courier 10, unpacked the 211, set it on my desk, plugged it in, connected it to my PC, loaded my Perfect Link communications software, and turned the 211 on. The whole process took 5 minutes, 3 of which were devoted to cutting the box open and removing the packing.

The DEST 211 really is that easy to use. I have installed and fussed with mice, modems, and assorted printers and struggled with serial interfaces and translation tables for typesetting systems. None of them was as easy to set up as the DEST 211. You don't even need the manual that comes with it. It has only three buttons—On/Off, Read, and Clear—and two connectors on the back, one for the power cord and one for the RS-232 cable.

When you turn on the DEST, it performs a self-test that checks the OCR's system and verifies that your PC has a communications program loaded and ready to receive data. The DEST 211

comes with an asynchronous serial interface that supports the X-on/X-off, ECHOPLEX, and Simplex protocols. Although it supports baud rates up to 9,600, I was unable to use higher than 2,400 on my system. The DEST 211 also has a bisynchronous interface; however, I was unable to test it.

If you have not loaded a communications program, the DEST 211 displays an error message, "Check WP com," during the self-test. Loading communications software and pressing the Clear button on the DEST clears the error, and you're ready to start scanning. DEST cannot check to see if you have opened an ASCII text file to receive data until after it scans a page and starts sending the data to your system. If you forgot to open a text or log file in your communications software, DEST displays another error message, "Waiting for WP." Opening a text file during the scanning process lets the data stream in, but you may lose the first few lines. In general, the DEST scans and outputs one full page every 25 seconds without your intervention.

Feeding pages into the DEST 211 is simply a matter of stacking them face up on the upper bin and pressing the Read button. Each page is slowly fed into the

DEST, and after the scanning element reads a page, the machine deposits it on its lower bed. The upper bin holds up to 75 pages and accommodates paper from 6 to 8½ inches in width, and up to 14 inches in length.

The DEST 211 has a spring-loaded clamshell housing that pulls forward, revealing the scanning window and the paper feed drum. You can simply open the housing to remove any jammed pages. The clamshell housing also makes it easy to clean the scanning window.

The DEST 211 sends a page image directly to the host. Although you will have to reformat paragraphs, the machine did seem to recognize tabular matter, and you'll have no trouble getting the ASCII text files into shape. I used several editors, including EDLIN, *Perfect Writer*, *PC-Write*, and *WordStar*, and could format and print all my test files without any problem at all.

DEST does offer optional format processor firmware for a variety of dedicated word processing systems. The Model 4125, its universal, or generic, forms processor, can be used with the PC but is of limited usefulness. The company also offers many PROMs that contain specific formatters for IBM, Digital, Wang, Lanier, Xerox, and Hewlett-Packard word processors. Using this firmware, the OCR converts ASCII codes for character spaces, paragraphs, tabs, boldfacing, underlining, centering, floating hyphens, and so forth into the appropriate code for each system.

As each page is scanned and the characters are matched, data flows into the text file on your system—as long as the DEST is scanning characters it recognizes. When it encounters a typeface it does not know, it will attempt to read the page anyway, looking for a possible match. Usually it will quit about halfway through and display the error message "unreadable page" on the operator panel.

The DEST 211 reads both typewritten and letter-quality printed samples without a hitch. As expected, it cannot read dot matrix or typeset text. The more-expensive DEST 212 Multi-PS reportedly can read up to 12 styles with its TypePak 11 software, including 4 proportionally spaced daisywheel typefaces.

The DEST 211 does well even with documents it acknowledges may be troublesome: you have to work hard to get an error. The machine performed so flawlessly on documents with the right typeface that I delighted in watching it struggle over a page I knew it could not read. Really bad photocopies, pages that are covered with



he DEST 211 does well even with documents it acknowledges may be troublesome; you have to work hard to get an error.

pen marks, or pages with smeared type will make the DEST balk.

Still, the range of type quality it does read is surprising. The DEST 211 uses digital filtering to clean up the small specks found on most photocopies. It also uses a context-matching algorithm to check itself. When scanning a group of characters that includes, for instance, a price like \$11.00 and the word Illinois, it distinguishes a one (1) from an uppercase "eye" (I) by checking the context and making a match based on preceding characters. As a result, most test samples had no errors. I attribute the errors I did encounter solely to copy quality. The DEST 211 sends unreadable characters as an "at" sign (@). Using a spelling checker or word processing program, you can easily locate and correct the errors.

The DEST 211 manual is appropriately short—40 pages, including the section on format processing—and almost comprehensive. It covers all three buttons, the six error messages, and basic maintenance and gives tips on document quality. Yet not once in the first 20 pages does it even hint that the DEST 211 uses an RS-232 interface. The manual depicts the power switch, the fuse, the Read and Clear buttons, the paper trays, and the reading

mechanism, but the only mention of that gold plug with 25 pins comes 20 pages later in the "Format Processor" section, as a hardware specification with the asynchronous and bisynchronous communications parameters.

The manual does not discuss pin assignments, nor how to use the cable the machine includes. Admittedly, the DEST 211 connected easily to my system, but if you have to make a null cable or cross any wires, you would have to call DEST to find out what the pin assignments might be. A simple one-page discussion of the RS-232 interface and pin assignments with a couple of pictures would be helpful, as would suggestions for host software.

The base price for the DEST 211 is \$5,995. With a format processor at \$1,495, and the TypePak 2 at \$990, the total would be \$8,480. The DEST 212, with a format processor and TypePak 11 (the full 11-font library), costs \$12,980.

The DEST 211 is an everyday business machine, pure and simple; it looks like a photocopier and is about as easy to operate. —Tom Stanton

## Hendrix TR100

Hendrix Technologies, which makes the Hendrix TR100, has closely followed developments in commercial OCR technology. In 1973 the company, then called Hendrix Electronics, brought out its first model, the TR-1. It read only specially designed fonts like OCR-A and the European OCR-B. Successive design changes produced the TR-2 in 1978, which could read underlining. To expand the market for OCRs, Hendrix also developed a special Selectric typeball, called Hendrix OCR-B, for use in legal offices.

The Tr-3, introduced in 1980, read a number of standard typewriter faces, including Courier and Prestige. In 1983, co-founder Dr. Ernest Hendrickson and current president Alton P. Tripp bought the company and changed both its name and its direction. The new company no longer builds its own OCRs. Instead, Hendrix has bought exclusive rights from a Japanese manufacturer to market its machine, dubbed the Hendrix TR100, in the U.S. But Hendrix has added an extra touch of Yankee ingenuity, which separates the



## Digging Through the Résumé Pile

With an OCR and a program called People Bank, companies can turn a stack of résumés into an electronic database.

Every personnel director knows the routine: Place a "Help Wanted" ad, and a few days later you're buried under mailsacks full of résumés to be stacked, sorted, and inevitably misplaced. It's no wonder harried employers often resort to professional job-search agencies.

Thanks to advances in optical character recognition technology, there's now a better way. A PC, hooked to an OCR and running a program called *People Bank*, could be the solution. *People Bank* is fast, relatively cheap, can remain totally in house, and, according to the company marketing it, is selling briskly. Thomas R. O'Connell, chairman of Advanced Resource Technology, a 2-year-old Reston, Virginia, firm, says the system proves that moderately priced OCRs, linked with the right PC hardware and software, have become practical.

First developed by Group I. of Herndon, Virginia, *People Bank* runs on an XT or an AT and can store some 8,000 two-page résumés in 35 megabytes of hard-disk storage. The database can be accessed with any combination of search words. Tell it to find every résumé in which the words *computer*, *Ph.D.*, and *will relocate* appear, and it will find and count them, gather them into a file, and scroll them by, with the search terms highlighted. It also allows you to create search term macros; for instance, you could define the search term *Ph.D.* to include *Doctorate*, *Doctor*, and *Dr.*

But the software is useless unless the paper résumés can be translated into machine-readable form. Keyboard entry or outside OCR services are options, says O'Connell, but he is most enthusiastic about the third and newest option—buying your own OCR—which has only become possible in the last year or so with the boom in affordable, reliable OCRs. In their marketing effort, O'Connell and his staff emphasize that desktop OCRs

are essential "if you want control from beginning to end, in-house."

ART has spent a year investigating three OCRs—DEST, Compuscan, and Kurzweil—and now offers any one as an option of the *People Bank* system. (*Editors note: The Compuscan was not ready at the time of this review.*) Both the DEST and Compuscan are desktop units in the same price range and work best with controlled hard copy—with two or three different typefaces. Feed these machines controlled copy, says O'Connell, and you'll get "essentially 100 percent recognition." But feed them copy with one of the various typefaces that appear on a random batch of résumés, and ART has found that only 60 percent will be read. The rest must be keystroked. For companies with just a few hundred résumés a month to process, says O'Connell, such machines may be adequate.

The Kurzweil machine can read virtually everything you give it; ART recommends it for high-volume operations. Along with its OCR circuitry, it houses full computer circuitry to support its sophisticated artificial intelligence programming. Although the Kurzweil unit costs about \$40,000, a company that needs to process thousands of résumés each month may find it the best choice, says O'Connell.

ART staffers are convinced that in time their system will create a revolution in the employment business, though it is not for everyone. Betsy McShane, director of recruiting practices, says some modern companies now have absolutely byzantine recruitment practices. "I visited a place where they spent \$3 million on fees to search firms last year and found that about 6 percent of the people hired through those search firms had already written to the company directly." Before coming to ART, McShane was employed by two "major executive search

firms" to install automatic coding, formatting, and résumé-tracking systems. Each résumé has to be condensed, coded, and keystroked. As McShane says, "this tedious process took about 3 years for each company." Then she saw *People Bank* and found she could not, she says, recommend anything else.

Among ART's first customers are several colleges. Patrick Schetz, assistant director of placement services for Michigan State University, says MSU plans to load the résumés of some 8,500 students into the system and run searches based on employers' requests.

Manipulating résumés is just one application of the system, says O'Connell; he believes that any work that requires storage and manipulation of large amounts of hard-copy text would be revolutionized by an OCR-*People Bank*-PC system. He cites automation of medical records, personnel records, or legal records. "We called it *People Bank* because you can't just say to a company, 'Hey, I've got this great system that has a thousand uses.' You have to show them an application that fills an immediate need. But there's no limit to what a system like this can do." —Brad Lemley

Brad Lemley is a Washington, D.C.-based freelance writer.

### PC FACT FILE

#### People Bank

Advanced Resource Technology  
11490 Commerce Park Dr. #310  
Reston, VA 20091  
(703) 620-6776

**List Price:** \$12,000 plus \$200 per month for upgrades and maintenance

**Requires:** XT or AT, 640K RAM, 10-megabyte hard disk, and one floppy drive

CIRCLE 679 ON READER SERVICE CARD

TR100 from much of its competition.

Hendrix decided to add one more board that it had designed for the TR100: a programmable format processor. As it turns out, this board makes the TR100 unique among desktop OCRs.

Unlike most desktop machines, which use special system-specific PROMs for format processing, Hendrix's format processor uses an EEPROM (Electrically Erasable Programmable Read-Only Memory) that stores both communications parameters and formatting codes. You input information into the EEPROM on a "header sheet," nothing more than a plain piece of paper with the ASCII formatting codes typed on it. The only restriction is that the header sheet must be typed in OCR-B, a universal OCR typeface. Once a header sheet is prepared, you feed it into the TR100, which scans the page and reads the parameters into the EEPROM. You can change communications parameters and format codes almost at will for virtually any computer system or word processing software. You must, however, know which ASCII codes your software uses for formatting commands.

A typical header sheet sends the TR100 parameters for the baud rate, word length, parity bit, stop bits, and handshaking used to communicate with a host. Asynchronous serial communication is standard. With an optional chip, you can add bi-

synchronous communications and send the TR100 bisynchronous parameters, including fixed or variable block, block size, number of lines per block, and a sign-on message to log on to a host mainframe.

The header sheets also can specify up to 30 different word processing parameters. Line spacing, tabbing, centering, underlining, spaces, and blank-line treatment



he TR100's programmable formatting capability almost overshadows the machine itself, which is compact and well designed.

can be specified for any word processing system. You can also indicate various hard-return codes for indented formats, columns, blank lines, and paragraph markers. This ability is particularly useful with tables or columnar matter that must be edited on the host. Instead of getting hard returns placed at the end of every line, you

can define where you want them placed as the host receives the text.

You can define default parameters and write them to the EEPROM by simply adding a /W command to a header sheet. Parameters can then be changed as necessary by feeding in a new header sheet. When the TR100 powers down, or if it is reset, the default parameters remain in the EEPROM for the next session. A new header sheet with a /W on it can overwrite these defaults at any time.

For example, you can prepare a default header sheet for an IBM PC running *WordStar* and another sheet for an IBM System 34. When you turn on the TR100, the *WordStar* default using asynchronous serial communications is installed. When you want to send text to the System 34, all you do is feed another header sheet that contains bisynchronous communication parameters and EBSEDIC format codes. After this session you can reset the TR100 and use the *WordStar* format processor again. If you understand ASCII character codes and have a grasp of communications, you could probably learn to create your own format sheets in a few hours, if you also know how your word processing system uses formatting codes.

The programmable formatting capability almost overshadows the TR100 itself, which is compact and well designed. It has a tilting feed tray that can handle up to 100 sheets. Pages are laid on the bin, which flips up and engages a feeding roller. A 2,048-photodiode array scans the first 1/2 inch of paper and determines the background value of white before scanning the text. Characters are scanned at the rate of 250 per second. The photodiode array reads a line at a time, with an error rate of 1 per 300,000 characters. Scanned pages are deposited in a bin beneath the scanning area.

The TR100 performs a self-test during power-up and can test itself at any time during a work session. Indicator lamps light during the self test and remain lit to isolate the problem area if an error is detected. After the test, you can select output port A or B (asynchronous or optional bisynchronous) and "indent" or "image" format modes.

The image format mode transmits white space in the margins, lines, and be-



Typewriter Model TR100

## MID-RANGE OCRs

tween columns as discrete space values. The TR100 sends a page image, much like a grid, to the host system. With 10-pitch type, one space equals  $\frac{1}{10}$  of an inch. Since the image mode does not sense multiple heading levels, lines of indented text are treated as separate paragraphs. You would use this mode with most block text formats, such as letters, memos, and reports.

The indent mode, also known as the outline mode, can sense multiple indented heading levels and inserts hard carriage returns only when the heading level changes. It can also insert tab codes instead of individual spaces on indents. Unlike the image mode, the indent mode can round off leading white spaces to the nearest tab spacing used in the format processor. For example, if a heading were indented 33 spaces, the TR100 would send four tab spaces (or 32 spaces) to the host if it were using an 8-space tab, dropping the remaining leading space.

### POFACT FILE

#### WorkLess Station, Model 211

DEST Corporation  
1201 Cadillac Ct.  
Milpitas, CA 95035  
(408) 946-7100  
List Price: \$5,995 with Courier 10 only.  
Typepak 2 is \$990  
Requires: RS-232 port, communications software that uses one stop bit.

CIRCLE 687 ON READER SERVICE CARD

#### Typereader Model TR100

Hendrix Technologies, Inc.  
444 E. Industrial Park Dr.  
Manchester, NH 03103  
(603) 669-9050  
List Price: \$10,500 with six fonts  
Requires: RS-232 port, communications software.

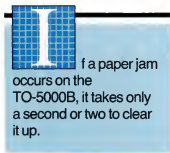
CIRCLE 686 ON READER SERVICE CARD

#### TO-5000B

TOTEC Co., Ltd.  
OCR Systems (distributor)  
One World Trade Center  
New York, NY 10048  
(212) 466-4667  
List Price: \$8,990  
Requires: RS-232 port, communications software.

CIRCLE 685 ON READER SERVICE CARD

Characters are scanned a line at a time, and each is isolated in an individual scanning frame. The TR100 uses what the company calls "matrix matching using the multiple similarity method." This phrase translates roughly as follows: instead of comparing every bit in a character matrix, the TR100 selects various parts of the ma-



trix and uses an algorithm to make a match against known character matrices. If a match isn't made, another part of the matrix is scanned, but 99 percent of all matches are made in the first pass.

Because each character is isolated in a frame on the digital circuit instead of the scanning head, the TR100 easily reads letter-quality and daisywheel proportional printing, but not typeset material. The TR100 was able to read about half of the dot matrix sample I tested it on, and only the boldface typeset sample, but that's more than most desktop OCRs can do. Needless to say, the daisywheel-printed and typewritten samples scanned without a hitch.

The base price of the TR100, with the programmable format processor and one asynchronous serial interface, is \$10,500. Six fonts come standard on the TR100: Courier 10, Prestige Elite, Hendrix/OCR-B, Pica, Courier 12, and Letter Gothic. Hendrix can also make up a new typeface-matching PROM for \$5,000. This price seems a small one to pay if you have thousands of sheets to scan, particularly when you compare it with the cost of hiring an operator to enter the material.

The TR100 offers the widest range of output capabilities I've seen on any device to date. Hendrix has taken a perfectly good

Japanese OCR and made it better. The format processor alone makes the TR100 one of the most innovative and practical desktop machines on the market.

—Tom Stanton

## TOTEC TO-5000B

Typical of its breed, the TOTEC TO-5000B OCR page reader is very much a "niche" product. It has very limited applications, and if they don't specifically suit your needs, it's probably not the machine for you. If you have to make ASCII files from typewritten documents that were produced in a typeface the TO-5000B can read, it will do the job admirably. On the other hand, the TO-5000B is expensive and requires operator supervision for occasional corrections at best, and for more than occasional corrections if the typeface match is not absolutely exact. This OCR must read many documents before it pays back its cost.

At first sight, the TO-5000B is reasonably unobtrusive (belying its 80-pound heft), and it runs quietly. When fed with a stream of documents whose typefaces it knows perfectly and hooked to a word processor for whose formatting commands it has been set up, the TO-5000B performs flawlessly. (At the OCR systems demonstration, the unit was cabled into a dedicated word processor rather than to an IBM PC.) Its nominal reading speed of 300 smoothly and efficiently turns documents into ASCII disk files, either for editing or for transmission via modem.

### Good Support Features

The TO-5000B list of support features is well conceived and impressive. Since no OCR can make sense of letterheads, you can set a dial on the unit to ignore a variable area at the top of the page. Similarly, to prevent reading errors, you can mask the impressive array of distinguished endorers down the left edge of letters that ask you to contribute to causes. The unit accommodates regular 8 1/2- by 11-inch, legal-size, and the intermediate-size paper commonly used in Europe and Japan (A4). Documents to be read follow a short, straight-line path, minimizing the possibility of jamming. If a paper jam occurs, it

takes only a second or two to clear it.

You can install up to six pushbutton-selected font PROMs in a single unit. These include Courier 10, Elite, Letter Gothic, OCR-A, OCR-B, Pica 10, Prestige Elite, Prestige Pica, and Courier 12. (Additional fonts, beyond the first, cost \$445, and you may order customized fonts at somewhat higher prices.) One of the pushbutton switch positions, Multi, electronically tries on the various installed font templates and selects the most suitable, with no apparent loss in reading speed. Various multiple-porting options are available for units used with several host systems.

#### Real-World Conditions

How well did the TO-5000B perform in an office, with a PC-XT and various types of documents? I used two different setups to check out the TO-5000B at *PC Magazine*. First, an OCR Systems installer and I connected it through an optional hardware/software package, *PC Intelligent Software* (\$1,200), in a bisync configuration designed to use the *MultiMate* word processing package. In this arrangement the unit could duplicate the "page image" formatting, together with support for boldface and underlining, that I had seen earlier at the OCR Systems demonstration.

But most of the time, the TOTEC was connected to my normal async RS-232 Com2 port. I used *CrossTalk*, which sup-

ports the required X-on/X-off protocol, and *XyWrite II-Plus*, the word processing program used at *PC*. I had to format the transmitted files manually but that was of no consequence for a brief test. In operation the TO-5000B reads an entire page into a memory buffer, and then the information is dumped to the host computer. While I used 2,400 baud mostly, I did successfully try 9,600 baud for a number of files, with no apparent ill effects.

Using the TO-5000B's sample materials, both the IBM Selectric Courier 72 and the Prestige Pica fonts transmitted several pages with only a single, apparently random error—an *s* was printed as an exclamation mark (!), the default error symbol. Using a Courier 12 element at 10 pitch (pica) spacing produced on my own Selectric worked equally well. Two errors (a *g* became a 9 and an *i* was printed as an error-sign) occurred when the Courier 12 font was reduced to 12-pitch (elite). With Prestige Elite, similar 10- and 12-pitch checks yielded only one error: an underlining mark (—) became a hyphen (-).

#### A Tougher Challenge

Other materials, however, provided a tougher challenge. Documents you might wish to turn into ASCII files often originate outside your office because if you know you'll need a document in this form, when you prepare it yourself, you'll do it

on a word processor. So I tried getting the TO-5000B to read a number of the breathlessly important press releases with which *PC Magazine* is inundated daily. Using what I took to be normal-looking typefaces, I typically got about one error every 90 characters. Some of these consisted of mistakenly substituted characters; the others were marked unreadable. Furthermore, the Courier font on my NEC Spinwriter (which is used for most of the program listings that are photoreproduced in *PC*) caused various random errors. For instance, it frequently, though not consistently, substituted 0 (zero) for O (capital "oh"). Almost as a joke, I ran some dot matrix printing through the machine and was surprised to find that while the draft quality was sufficiently readable and easily correctable, the letter quality of the same (Orator) type style caused even the patient TO-5000B to balk.

On the other hand, I found that wrinkled documents, visibly dirty photocopies, yellow marker highlighting, ball pen underlining (without touching the letters), and typing mistakes corrected with White Out caused the TO-5000B no trouble. As you would expect, drawing a black line diagonally across the typescript of a document produces plenty of errors.

#### A Caveat

The TO-5000B should not be faulted for its every failure because I suspect that other mid-priced OCRs would give no better results. But prospective buyers should be wary of the limitations of today's state-of-the-art OCRs. They are not the DP equivalent of photocopiers, whose output, if readable, need never be proofread and corrected. Rather, if your need to rekey existing documents justifies using a mid-range OCR such as the TOTEC 5000B, you should order an optional, customized type font (if necessary) and integrate it with a formatting word processor. And, of course, you have to plan on having an operator on hand to catch and correct predictable errors, especially when dealing with material that originates outside the office. With an open-eyed approach, the TO-5000B should give you long and trouble-free service.—Craig L. Stark ■



At left: the TO-5000B



# THE OBERON OMNI-READER: RECOGNITION BECOMES AFFORDABLE

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**T**he Oberon Omni-Reader takes a novel approach to the mechanics of the optical character reader: it cuts costs by making you do the work of moving the scanner over the paper.

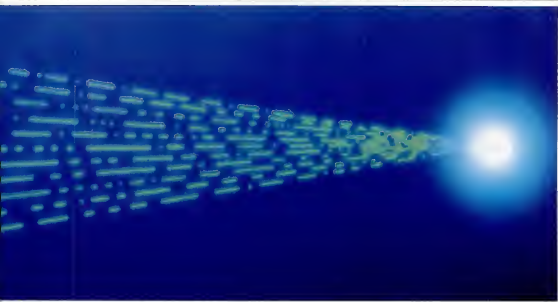
Unless you chew through reams of paper faster than a chainsaw, an optical character reader is generally an unbudgetable expense. It's hard to justify paying upwards of \$5,000 if you have only an occasional need to automatically enter typed text into a format that is readable by your PC.

The Oberon Omni-Reader breaks through that price barrier. At about \$500, it's by far the cheapest optical character recognition device you can attach to your PC. Yet, after that minimal expense and about 10 minutes of installation, you'll have the benefits of optical character recognition. Your PC will be able to directly read typewritten text into your favorite word processing program with little more effort than a wave of your hand—literally.

## The Electronic Clipboard

The Omni-Reader isn't priced like a typical OCR, nor does it look much like one. The whole machine is built around a big, thick wedge of plastic that resembles nothing so much as an electrified, overweight clipboard without the clip on the top. At the top edge of what would be the writing surface of the clipboard is a row of LED indicators. At the left is a shiny steel tube that serves as the track for a movable plastic slider.

A mostly clear plastic ruler with a long



slot in its middle clips onto this slider and serves as the track for the scanner itself. The scanner is a graspable chunk of charcoal-colored plastic about the size of a PCjr game cartridge, but adorned with a single LED on top and a rocker switch on one of its narrower sides.

Inside the clipboard are the brains of the system, a top-quality, glass-epoxy printed circuit board bedecked with a microprocessor, a big, custom, Large Scale Integration (LSI) chip, three big ROM chips, and a handful of discrete-logic ICs and transistors. To keep interference from escaping the plastic case, the electronics are sandwiched between two steel plates that also serve as a ground for all connections to the outside world.

The Omni-Reader connects to your PC by an RS-232 jack on the top side of the "clipboard." Electronically, the machine acts like a one-way modem and requires a "straight-through" cable when used with a PC. Power and the scanner itself are also tethered to jacks on the clipboard top by their own thin cables. Two DIP switches, one each to adjust the RS-232 speed and the few scanning options, are also on the top side.

To operate the Omni-Reader, you must first manually lay each sheet to be scanned on the clipboard. In theory, the sheet is

held in place by two tacky strips running the length of the board. Next, you position the ruler over the text so that a single line shows through the slot in the ruler. Finally, press down the rocker switch on the scanner and move it in a single, broad sweep across the full line of type. With some luck and skill, the same text characters should appear on the screen of your PC a few seconds later.

#### Do-It-Yourself Savings

The key to the Omni-Reader's low cost is that the machine makes you do the expensive part of the work—moving the scanner around. While other OCRs use elaborate combinations of belts, pulleys, cams, and cogs to pull paper past a scanner and move the scanner past each character, the Omni-Reader puts your hand to work pushing the optical scanner along its plastic guide track. Using the Omni-Reader is akin to the first step in speed-reading—whisking your finger past each word of the text.

Making this manual, minimal-expense system workable involved the synthesis of a lot of clever technology. Instead of getting its optical impulses from the smooth, predictable scanning of a machine, the Omni-Reader must cope with the vagaries of human muscle. Compared to a precision

machine's work, the wave of your hand is a big variable; the effective scanning rate changes with each imperceptible speed variation you make in your sweep across the page.

The Omni-Reader copes with such variations admirably. Just as long as you don't move the scanner too quickly for the device to assess the data you're inputting, the Omni-Reader can buffer your humanness into digital perfection. In fact, the Omni-Reader is smart enough to sort things out into normal English if you scan from right to left instead of the standard direction.

The secret to the Omni-Reader's smarts is a timing track, which consists of a series of markings on the bottom perimeter of the slot in its rule-*cum*-guide track. The fixed pattern of dashes encoded into the timing marks supplies the Omni-Reader with a frame of reference for judging the speed, and thence the relative reading position of the scanner. Take the scanner out of its track and it won't read anything.

Fortunately, the scanning track is easily detached from the clipboard so you can lay it on bound manuscripts or other objects too big to fit. Further, Oberon offers an optional, larger rule to track the scanner across documents that are too wide to fit on the clipboard.

**Easy Installation**

Installing the Omni-Reader hardware is merely a matter of making a few not-so-difficult connections. You run a standard serial cable from an asynchronous port on your PC to the female DB-25 jack on the Omni-Reader and plug the scanning device into the clipboard. You then plug the big auxiliary transformer into a wall outlet and its thin umbilical cable into the clipboard.

Clever software, including a special device driver program, integrates the Omni-Reader into your system as an input device. It requires no additional communications software. When properly set up to communicate with your word processor, the Omni-Reader acts like a supplementary keyboard, sending the characters it reads directly into the text editor as if they had been typed.

Installing the software may be the only tricky part of the setup process. You must add two new entries—`DEVICE=ANSI.SYS` and `DEVICE=OMNI.COM`—to the `CONFIG.SYS` file on your boot disk or copy the `CONFIG` file supplied by Oberon on its software distribution disk. Then you must ensure that the two files with the names you've added to the `CONFIG.SYS` file are also present on the boot disk. (Oberon supplies `OMNI.COM`. `ANSI.SYS` is included on your PC-DOS distribution disk.)

Next you must tell the software the communications parameters you've already set on the Omni-Reader's DIP switches by running a menu-driven program (with useful on-line help) called `OMNICON.EXE`. Using this program, you select baud rate, the serial port to which you choose to attach the Omni-Reader, and translations of any specific strings that the Omni-Reader sends to your PC—that



The hand-held scanning process that operates the Oberon Omni-Reader.

is, you can specify character sequences that the Omni-Reader will later translate into commands or other strings of characters. With this information, the `OMNICON.EXE` program creates a configuration file, which is written to disk and must be present on whatever disk you use to put the Omni-Reader into operation.

To start using the Omni-Reader, you must type the command `OMNICON` followed by the name of the configuration file you've made, then the name of whatever application program you want to send the characters to. Typically you would interface the Omni-Reader with your favorite word processor. Conveniently for old stalwarts like me, Oberon includes complete instructions on how to write a batch file that makes using the Omni-Reader with *WordStar* as easy as typing `RUN-WS`.

**Smart Reading**

Once you get the hang of scanning, the Omni-Reader is simplicity itself to use. Just press the downside of the rocker

switch on the scanner before you start to read a line and release it when you're finished. The Omni-Reader pays no attention at all to large blank spaces at the ends of text lines, indents, and other such aspects of page formatting. It merely sends each character it recognizes directly to your word processor (or other program) as if you had sat down and typed them in at the keyboard. Through the configuration program, you can set the Omni-Reader to send carriage returns to your word processor by recognizing either text symbols or a press on the reset side of the scanner's rocker switch.

The Oberon engineers seem dedicated to freeing you from the keyboard. In order to issue commands to the Omni-Reader, you don't type them—you scan them. Several special Omni-Reader instructions are printed on the clipboard itself, such as the one that selects from among the fonts that the Omni-Reader will recognize. Other commands are printed in the spiral-bound instruction manual—to send them to the

**PC FACT FILE****Omni-Reader**

Oberon International  
5525 MacArthur Blvd., Suite 630  
Irving, TX 75038  
(800) 2-OBBERON

List Price: \$499

Requires: Asynchronous communications adapter.

CIRCLE 700 ON READER SERVICE CARD



reader, just flop the book down on the clipboard and scan the printing.

### Practice Makes Almost Perfect

As freewheeling as using the Omni-Reader sounds, you can't just go ahead and scan lines in any old way you please. You must whisk the scanner across its rule within a period of 1/2 to 3 seconds. If you go too fast, all the LEDs in the world seem to flash at you, and the Omni-Reader repeatedly beeps to scold you into slowing down. In order to put a stop to the fireworks, just press the reset button and try again. If you go too slow, you add to the error rate—if the Omni-Reader recognizes any characters at all.

If the Omni-Reader is successful in identifying each character on the line you scan (correctly or not!), it beeps in affirmation (after a brief processing delay). If it has trouble recognizing some of the characters, it beeps twice and gives you a chance to cancel the reading of that line (by pressing the reset button) or accept the possibly erroneous text (by continuing on to the next line).

Explaining how to use the Omni-Reader is more complex than actually using it. The proper scanning procedure is not difficult to learn: you have only one rocker switch (with two positions) to press. But, like anything else you do with your hands, using the Omni-Reader is a skill that develops with practice. The more you use the Omni-Reader, the better it works and the fewer errors you get because you learn how to move the scanner more smoothly and with a closer approximation of its ideal speed.

One of the trade-offs Oberon made to

bring the Omni-Reader's price down involved the number of fonts it will recognize. It knows only four: Courier 10, Courier 12, Letter Gothic, and Prestige Elite. More fonts can be downloaded from your PC into the Omni-Reader's memory (although Oberon didn't send me any downloadable fonts to test). The manual indicates that future versions of the software will enable you to teach new fonts to the Omni-Reader yourself.

The Omni-Reader is not capable of



automatically sorting out different fonts; to minimize errors you must choose the correct font. To aid you in making the right call, Oberon supplies a clear plastic sheet on which are printed selected letters from each font the machine recognizes. You can easily match fonts by laying the plastic sheet over a sample of the text you want to read.

The biggest sacrifice you make for the low price of the Omni-Reader appears to be accuracy. The only material I was able

to get the Omni-Reader to recognize without any error at all was Oberon's sample text. Letter Gothic and Elite text that other, more-expensive OCR machines had recognized flawlessly resulted in one or more errors per line, even when the Omni-Reader's beeper indicated that the text had been deciphered and that all was well.

Unlike more-complex machines, however, the Omni-Reader's error rate did not increase by any great measure with photo-static copies or good-quality offset copies, and it even made an effort at reading carbon copies, although the results were somewhat less accurate. For the most part the machine ignores interlineations, editing marks if done in blue pencil, and even colored paper. Further, the Omni-Reader will handle nearly any kind of paper without complaint, because its manual paper-feeding mechanism necessarily treats each sheet humanely.

Compared with the desktop OCRs that are currently available, the Omni-Reader is slow. To read each line, you must properly position the guide rail—which can be tricky with single-spaced text—before dragging the scanner across it at the Omni-Reader's desired speed. Then the Omni-Reader requires that you wait until it deciphers one string of characters before you burden its mind with another set. If you try to press it for higher performance by starting to read the next line before it beeps its readiness, you'll lose text. Hence, the recognition rate of the machine sets its maximum speed at between 5 and 10 seconds per line. A single page of double-spaced text takes several minutes to scan completely. Since that's much faster than most people can type, the result is a more-efficient transcription of printed text.

The Omni-Reader is useful for making drafts but unacceptable if you plan on translating hard copy into finished electronic form without proofreading. Because of the wait between each line, it can be tedious to use. But if you have to get text into electronic form and you don't want to mortgage your house and sell the kids to buy a full-scale OCR, the Omni-Reader is not just your best alternative, it may be the only one. ■

Winn L. Rosch is a contributing editor of PC Magazine.

Great wisdom is generous, petty wisdom is contentious.  
Great speech is impassioned, small speech cantankerous.  
— Chuang-tzu (369-286 B.C.)

A man of genius makes no mistakes. His errors are volitional and are the portals of discovery.  
— James Joyce (1882-1941)

Samples of two of the four typefaces that the Omni-Reader can digest: Courier 12 (top) and Courier 10 (bottom). Both were produced on standard typewriters.



# SCANNERS AT A GLANCE

**S**toring two-dimensional images in your PC can help you enhance your database files. But the huge memory requirements of this technology need to be tamed.

Even at the legendary exchange rate of 1,000 words to the picture, sometimes mere words just won't do. There are just too many images that you might want to store or process with a PC that are impractical or impossible to translate verbally. That's where scanners come in. These peripheral devices take two-dimensional images and translate them into a series of computer bits. Applications for this technology lie in the fields of drafting, security, finance, business archiving, and graphics, to name a few.

You can think of a scanner as a graphics dot matrix printer running in reverse. Rather than working down the page putting a dot on the paper wherever the computer says to make a mark, a scanner looks at an existing image as a series of closely packed dots and tells the computer to record that data wherever it finds a darkened spot. As a printer goes from data to image, a scanner goes from image to data.

Scanners range in price from a few hundred dollars to a few hundred thousand. The majority of them are designed to be used in conjunction with minicomputers or high-priced workstations, principally in the graphics arts, engineering, and document-storage industries. Fortunately, in the last year or two, the scanner industry has been busy designing new machines suitable for PC use.

There has recently been a great deal of commotion in the scanner market with new announcements coming almost every week. Many of the machines featured at computer shows, particularly those that are made by photo-copier firms, have yet to show up in any quantity in the marketplace. As a result, you're going to have to wait for the eventual software support and

applications development to be done.

Not every device intended to enter an image into a PC is a scanner. Within the range of image-entry devices, scanners work through each page sequentially, emphasize high resolution, and output their results as dot arrays much like a bit-image for display but with a substantially larger number of dots.

Video digitizers, in particular, are not really scanners. These increasingly popular input devices take the output from a video camera (or any other video source) and change it to a dot array that can be entered into a PC. While undoubtedly useful for many applications, video digitizers are typically limited to the resolution of a television camera. Each image might have a resolution of 400 lines by 640 dots, compared to a scanner's resolution of about 2,000 lines by 3,000 dots. Image fidelity is dependent on the product of horizontal and vertical resolution. A digitized television image has about 256,000 dots total, while a scanner image has close to 6 million dots—20 times the detail of the digitized video image.

Facsimile machines come close to scanners, and, in fact, some firms claim that a combination of a scanner with a PC can work as a fax. The popular Group III standard fax machines work at 200 dots per inch, a comparable resolution to most scanners for the PC market. Nevertheless, the fax machine is used for both sending and receiving and also sends data out over a serial line. Scanners are only input devices and send data at high rates over a parallel connection.

Scanners are not strictly optical character readers either, although they can act as a part of one of these images-to-language

processors. Optical character readers attempt to convert the images they "see" into ASCII text or codes, while scanners generally let the computer do any needed processing. A scanner accepts both pictorial and textual images, in any font, in any size, at any spacing. An OCR might extract 2,000 characters from a page for a total of approximately 15,000 bits, compared to the almost 6 million bits for a totally scanned page.

Lastly, scanners are not digitizer pads, although both devices might be used for input to CAD (computer-aided design) systems. You work interactively with a digitizer pad, manually positioning the puck or pen over each point you want stored in your image. Scanners, however, read the entire image, letting the computer extract the meaningful points.

## What It Sees Is What You Get

Typically, a scanner for a PC consists of a box topped with a flat or convex glass plate, much like a desktop office copy machine. Inside the box, a bright light illuminates the image, and a CCD (charge-coupled device) chip picks up the reflection. As the chip, or set of mirrors and lenses that focus the reflected light on the chip, moves down the page, the reflected light is converted to electronic pulses, which, in turn, are sent out to the computer.

On some models, the CCD chip stays fixed, and the paper moves back and forth, pulled by a set of rollers. On other systems, a camera-like scanning unit mounted several feet over a flat surface looks down on the material to be entered.

The relationship between the printer and the scanner is evident in a low-cost scanner, which got its start on the Apple

Macintosh and will soon show up for the PC family. By literally replacing the ribbon cartridge of a standard printer with a photosensor and support circuitry, Thunderware, of Orinda, California has produced a device called the ThunderScan that will scan anything that is rolled through the printer. Resolution on the Apple model is 300 dots per inch, and the cost is less than \$300.

Whether it's CCD or photocell technology, the key step in optical scanning is changing the perceived light into a recorded dot. For simple black-and-white images, deciding whether an image position represents a white or black dot is easy—you set a threshold level, either by a control on the scanner or through software, and, any time the light at the dot position falls below that cutoff, the scanner considers it black. For originals with intermediate tones (gray scales), it's a little more complex.

To get a realistic image out of an original with intermediate tones, the scanner has to break tonal regions into dot patterns, much the same way photos are broken up for magazine reproduction. If an area is, for example, 40 percent of the way between the whitest white on the page and the darkest dark, you don't want it all to be considered white because it is below the midpoint. Instead, with help from software, the scanner makes 40 percent of the dots in the region dark and 60 percent white. When you look at the result, your eye and brain average the dot colors, recreating the 40 percent gray level.

Once you can do gray scales, the next step in scanner technology is color. Only one scanner for the PC (the SpectraSCAN from LaserFAX) does color, but eventually, color processing should become common. The LaserFAX machine works its magic by placing a series of color filters over the CCD array, one after the other. If you want a full-color scan, the system scans the image through four times (once for each primary color and once for black).

#### Condense the Dots

After the scanner has produced the right dots, figuring out what to do with them is also quite a challenge. Six million dots is almost 1 million bytes—even an AT can only store about a dozen detailed full-size

sheets. All practical scanning systems must include some kind of data-reduction technique to reduce the amount of storage required.

The first step to data reduction is to use image partitioning. In most applications, only certain portions of a full page contain the images that need saving, so cutting out the rest of the area can cut data-storage requirements dramatically. For example, an employee identification card might have a 2-inch square photograph, a 1-inch square fingerprint, and a 1- by 2-inch signature, for a total of 5 square inches of graphics. Storing those 5 inches rather than the total 93 square inches for a full-size sheet cuts the storage bill by almost 95 percent.

Applying data compression techniques on the bit patterns can also conserve storage space. In most images, especially line art, sections of dark or light tend to run on for dozens or even hundreds of dots. Instead of storing each dot, most scanners include software that breaks images into sequences of dot color and repetition factor. Unfortunately, these compression techniques are not nearly as effective for tonal images.

Lastly, just because the scanner can produce thousands of dots per square inch doesn't mean you have to keep them all. If you have something like an inventory or

personnel file where simple recognition is more important than detail, some systems let you extract a portion of the dots needed to make a usable but lower-fidelity image of the file.

#### Scanner Applications

Manufacturers are still working on different uses for scanners. One popular application, optical character recognition, uses the scanner to capture the data, then a PC to figure out what the scanned letter represents. As of early spring, though, no scanner firm in the PC market actually had optical character recognition software ready to ship. (PC reviews one model, the Datacopy 700, at the end of this article, whose software is in the prerelease stage. Other scanners on the market are briefly described in a sidebar, "Other Machines to Scan.")

Similarly, taking an existing engineering blueprint and entering it into a CAD system could interest many potential buyers. The problem with this application is similar to but more complex than the difficulties associated with optical character recognition. A CAD system works on vectors (lines and shapes), while the scanner only sees dots. Deciding which dots are part of what shapes is difficult, particularly if the drawing has small features and lines



The Datacopy 700 scanner, when used with optional Character Image Recognition software, combines image scanning with OCR capabilities.

that are partially broken or smeared.

The most popular application for scanners right now is adding visual fields to databases. Certain codes can be placed in ordinary database files and intercepted later by an output driver program, which substitutes a stored picture for either screen dis-

play or printed output. Personnel files, museum collections, financial records, and artwork could all be easily tracked with such a system.

The graphic arts field has been dominated by high-priced scanners, but interest is starting to build in the PC models—and

with good reason, given their expanding capabilities. The LaserFAX color scanner, for example, can team up with a graphics package to make slides, illustrations, and even page layouts.

Where all this technology will lead is difficult to say. With higher-resolution dis-

## Other Machines to Scan

Here is a list of some other scanners for the PC that are on the market or soon will be.

The **Cobra**, from DEST in Milpitas, California. Intended for OEM sales, the Cobra is a moving-paper model that you feed one sheet to at a time. It scans at 300 × 300 dpi and can handle paper from 3½ inches square to 8½ by 11 inches. DEST, which is primarily an OCR manufacturer, says the Cobra can also be equipped for optical character reading.

The **EIT-PS**, from Electronic Information Technology of Fairfield, New Jersey. This model is instantly recognizable because it uses a curved glass faceplate, against which you place the paper or book to be copied (the curve can accommodate bound books). It scans at 240 dpi and captures up to an 8½-by-14-inch image. EIT has announced OCR software scheduled for delivery this spring. The OEM price is just under \$2,500.

The **SpectraSCAN 200** and **DS-200**, from LaserFAX in Naples, Florida. The SpectraSCAN is the only low-cost scanner that processes in color, and the DS-200 is the black-and-white model. Both machines feature an open architecture, with several slots available for expansion boards. One board, announced for delivery this spring, will enable the machines to do optical character reading. Prices are \$2,995 for the black-and-white model and \$3,995 for the color.

The **MS-200** from Microtek Lab of Gardena, California. This desktop scanner works at 200 dpi and accepts documents up to 8½ by 14 inches. It features a stationary scan head, and the paper feeds in through a slot in the top of the unit. Evaluation models are under \$2,000, and

quantity OEM prices are substantially less.

In addition, all the major Japanese copier companies (including Ricoh, Fujitsu, Matsushita, and Sharp) have scanners either out now or under development, but so far, these have not been extensively promoted in the U.S. Similarly, most of the high-end CAD and graphics-arts technology firms have scanners, but these are more likely to cost in the \$50,000 to \$200,000 range.

—Steve Rosenthal

### PC FACT FILE

#### EIT-PS

Electronic Information Technology, Inc.  
373 Rt. 46 West  
Fairfield, NJ 07006  
(201) 227-1447

List Price: \$2,487

**Requires:** Hard disk drive, 256K RAM, DOS 2.0 or later, IBM Color/Graphics Adapter or Tecmar Graphics Master adapter (monochrome display).

CIRCLE 684 ON READER SERVICE CARD

#### SpectraSCAN 200

LaserFAX  
2000 Palm St. South  
Naples, FL 33962  
(813) 775-2737

List Price: \$3,995

**Requires:** 256K RAM, DOS 2.0 or later, one disk drive (hard disk recommended), mouse, graphics adapter.

CIRCLE 683 ON READER SERVICE CARD

#### SpectraSCAN DS-200

LaserFAX  
2000 Palm St. South  
Naples, FL 33962  
(813) 775-2737

List Price: \$2,995

**Requires:** 256 RAM, DOS 2.0 or later, one disk drive (hard disk recommended), mouse, color graphics adapter.

CIRCLE 682 ON READER SERVICE CARD

#### Cobra

DEST Corporation  
1201 Cadillac Ct.  
Milpitas, CA 95035  
(408) 946-7100

DEST is releasing this model only to OEMs and will not yet disclose pricing or minimum system configurations for use with the IBM PC.

CIRCLE 680 ON READER SERVICE CARD

#### MS-200 Image Scanner

Microtek Lab, Inc.  
17221 Southwestern Ave.  
Gardena, CA 90247  
(213) 538-5369

**List Price:** \$1,800, including required interface board; less in larger quantities.  
**Requires:** 256K RAM, one disk drive, DOS 2.0 or later.

CIRCLE 681 ON READER SERVICE CARD

plays arriving, multimegabyte optical disks on the horizon, and increasing numbers of high-resolution printers in the stores, text-only input and output may soon seem as limiting as text-only video displays. When you think of the future, even the part concerning computers, it's probably a world that words alone can't describe. ■

### Datacopy 700

The Datacopy 700 scanner, already a popular device for adding pictorial data to database records, is about to become an optical character reader as well. Datacopy now markets an optional *Character Image Recognition* software package for the 700. The system works quite well as a scanner, but the CIR software was only available in prerelease form when PC borrowed a machine for review—so view any comments made about the optical character reading capabilities with that limitation in mind.

Like most scanning systems for the PC, the 700 is a combination of a hardware scanner that reads the image, an interface for the PC, and software that controls the whole process. In Datacopy's parlance, the scanning box is called the Model 210 Image Scanner, the interface is the Model 700 Interface Card, and the software is the *Word Image Processing System (WIPS)*. As noted, the optical character reading software, which adds about \$700 to the \$3,950 base price for the Datacopy 700, goes by the moniker *Character Image Recognition (CIR)*.

The image scanner is a flat box a little shorter than a PC. You put documents face down on its 8½" by 12-inch glass faceplate, much as you would on a desktop copy machine. Scanning is software-controlled from the PC. The hardware has only one manual control—normal, darker, or lighter—plus two status lights for ready and busy modes.

The interface card is a half-size board, but you'll need at least an XT or its equivalent to make use of the system regardless of your available slot sizes. Each image, at full resolution, takes up a half-megabyte of storage, so a hard disk is essential. The software also requires a Hercules Graphics

card or something similar to provide the screen detail needed for viewing the images.

### Modus Operandi

Using the 700 is fairly simple. You call up the *WIPS* software using a BAT file that also automatically sets up the Hercules card. *WIPS* gives you a tree-structured set of menus, most of which you should be able to use without even looking at the manual. Once you've set up a few parameters (which can be saved for reuse), you give a filename as the destination for the image and issue the command to start scanning.

After a brief delay, a green light sweeps



down the page, and you see the scanned image reproduced on screen. As the scanning progresses, a status line keeps you informed of what percent of the process is done, but, after a few runs, it gets so you can tell how the process is going just by the sounds of the scanner mechanism.

The resolution with the Hercules card and a monochrome screen is good, but it's nowhere near the possible 1,592 × 2,626 dots the Datacopy 700 can capture. When you see the image on screen, you see an approximation, not a fully detailed image.

To see these minute details, you exit the capture menu, choose Edit from the main menu, and then, using the Edit menu, you define a smaller region that you'd like to view or work with in detail (you can also view a section of the image with the Zoom menu). The software lets you define the upper-left corner and lower-right of a box with the F1 and the cursor arrow keys, and these boundaries are shown on the scanner image. When you choose to zoom, that

same box is enlarged in detail on the right half of the screen. You can cause the selected area to take over the entire screen by pressing Z. (This feature is not noted or included in the menus, although it is mentioned in the manual.)

The Edit menu contains options for filling a region with either black or white, and inverting, rotating, or dropping in a scaled or cut-to-fit image. If you want to scan a picture that has gray-scale values (such as a photograph or shaded drawing), you can pick either of two settings for simulating gray with a mixture of black and white dots.

### Taking a Look

Once you've stored your images, you can view them on screen or print them out. For on-screen viewing, you can either use *WIPS*, or you can use a background utility called *PAINT* to stick the images in database files.

*PAINT*, which is loaded in by the same BAT file that starts up *WIPS*, sits in memory and is activated by pushing Alt-F10. The utility looks at the database text on screen to see if you've set aside an area for reproducing a stored image. If it finds a "bull's-eye" sequence consisting of +> or \*>, a saved-image filename, and an optional "toe" sequence that indicates the end of the space, *PAINT* replaces those special symbols and the reserved space with the proper stored image.

Similarly, if you print a file saved in printer-image form (with the print-to-file commands on most software packages) using the *IMPRINT* utility, the software will again replace any bull's-eye and toe sequence with the appropriate image. The version of *WIPS* that I looked at supported Epson/IBM printers, as well as QMS and HP laser models. With the Epson, you lose some resolution, but the HP will set you back a few grand, and the QMS will set you back ten.

You can use *PAINT* and *IMPRINT*'s text-and-picture capabilities to add graphics to your memos, but the most common use for the Datacopy 700 is to make visual annotations on databases. Neither *PAINT* nor *IMPRINT* particularly cares how you get the bull's-eye and toe on-screen or in the file, so you will be able to add pictures to *dbase III* or whatever database you are

using as easily as running a graph in *Symphony*.

#### Add Reading Ability

Once you design a scanner to provide a visual route into the computer for pictures, it would only be logical to see whether it can do the same for printed words. When *PC* looked at the Datacopy 700, it was just nearing field testing of the *Character Image Recognition (CIR)* software.

Basically, *CIR* takes a scanned image of a page and turns it into ASCII text. The original image, even though it represents characters, looks like a set of lines and curves to the scanner, so making the translation to computer code is a complex question of image recognition.

*CIR* is structured in a similar fashion to *WIPS*, with menus, submenus, and on-screen box displays. You set up parameters such as the filename, specify a typeface or the best fit, and denote what character should be used when the scanner can't figure out what a symbol represents.

You can run *CIR* interactively or automatically. In the interactive mode, when the system can't figure how to read a character, it stops and asks you for verification. In the automatic mode, the designated fill character replaces any unreadable symbols, and the program keeps going. Datacopy claims the final release will recognize several common office typewriter fonts, with error rates below 1 percent. Note, however, that this rate means an average page might have several errors, so you wouldn't want to run your bank or your automated production line on unverified *CIR*-scanned documents.

If you're patient and methodical, you'll find the Datacopy 700 extremely easy to set up and use. Capturing an image basically takes about as much skill as making a

photocopy. And if you can open up the case of your PC, plug in a board, close up the case, and plug in a cable, you can install the 700.

However, if you're impatient, you may have a few problems. The scanner takes about 35 seconds to capture an image and almost that long again to reset itself for the next scan. I had the scanner lock up on me a few times, but I was overworking the machine during the tests.

For example, I tried to store photos in compressed form, something you're not supposed to do. Sometimes the scanner would jam, other times it wouldn't. I also ran the scanner without waiting for it to reset. Again it would jam, but not consistent-



he big question concerning the Datacopy 700 is whether it will justify its price.

ly. I really couldn't pin down any one thing that made the scanner choke every time. Powering up the scanner and rebooting the XT always fixed the problem, and I never lost anything more than the scan in progress.

As mentioned, you activate most of the procedures by menu, so you don't normally have to memorize commands. But the menu orientation makes it that much harder to remember that there are a few direct commands (such as Z for zoom).

A full-size 8 1/2- by 11-inch image stored as a complete dot pattern takes over 484K of disk space, so any serious database will quickly drive you to a bigger disk. Firms like National Memory Systems or Maxtor, which make high-capacity disks, ought to give away scanners, just to sell more and bigger drives.

Seriously, you'll quickly realize that image storage on a PC is more practical for small windows of line drawings, such as signatures or diagrams, than it is for boxes

of full-size photographs.

The software will compress line images and text (which it treats as a line image for this purpose) at ratios as high as 10 to 1. But you pay a price in slower storing and loading times for this space savings. Normally, a full-size image takes about 40 seconds to load or store on an XT, and that time is doubled if the system is doing compression or restoration.

Noise is another factor you might want to consider when you look at scanners (or any other electromechanical device). The Datacopy 700 makes no noise when idle, but in capture and reset mode, it can pump out about 78 dB (A), about the loudness of a closing car door or a medium-size truck passing on level ground. You wouldn't want to run it in a library.

Whenever I called Datacopy, the staff was pleasant, helpful, and quick to get back with an answer. The equipment is warranted for 90 days. However, the *WIPS* software comes on a SoftGuard-protected disk (which allows you to install it on a hard-disk, de-install it, and move it to another machine). Datacopy protects the disk, it says, so you won't buy just one scanner and process the images at multiple stations. Personally, I think it'd be better off using site licenses.

#### Documentation

The manuals are clear and adequate for installation and basic operation, but they don't provide any technical information whatsoever. According to Datacopy, it will supply information about the storage format on request so you can integrate the images with your custom software, but no such information comes standard with the scanner.

As with any other piece of substantial equipment, the big question concerning the Datacopy 700 is whether it will justify its price and add to the value of the work environment. The Datacopy 700 does its task well, isn't difficult to use, and doesn't require an expert to keep it running. As for whether it justifies its price, that's between you, your application, and your spreadsheet. ■

Steve Rosenthal is a writer, television producer, and editor whose work appears regularly in several computer magazines.

#### PC FACT FILE

##### Model 700 Image Processing System Datacopy

1215 Terra Bella Avenue  
Mountain View, CA 94043  
(415) 965-7900

List Price: \$3,950

Requires: Hercules Graphic Adapter,  
DOS 2.0 or later.

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### **Dedicated cursor and page controls**

The cursor controls are always available right next to the number keys, and, at the touch of the local shift, they become page up and down, and tab left and right keys.

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To keep it compact, we couldn't include the whole alphabet, but Touchstone 2 does have A, B, and C to use as handy and easily-remembered hooks for user-defined keyboard macros.

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Touchstone 2 data entry takes about 40% of the hand movement usually required with the standard PC keyboard. Even more important, it eliminates the need to look for each digit as it is entered.

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Low-profile design meets DIN specs; reduces fatigue. Number pad has slide-mounted Enter and math keys that conform to the traditional calculator layout. Heavy-duty case is easily lap-portable, but won't slide around. Standard locating pin on 5 key helps keep fingers where they belong.

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CIRCLE 299 ON READER SERVICE CARD

PC continues to run the bases after last year's highly successful Project: Database software roundup. Here are eight rookies that have joined the lineup since then, some of them bound for stardom.



# The Latest on DATABASES

**T**he electronic database has always been one of the microcomputer's most highly prized applications. Used to organize, maintain, and retrieve information from a large body of data, database software offers tremendous productivity gains by making simple work of otherwise tedious tasks.

A year ago, *PC Magazine* matched 18 writers with 66 database programs to create Project: Database, a comprehensive roundup and review that spanned seven issues (Volume 3 Numbers 11-17).

What has happened in the database program market since the landmark work of last year? If 12 months is equivalent to 7 "dog years," then, by analogy, 1 month must equal 1 "micro year." Software companies have been churning out a multitude of products to help you maintain, select, sort, and report your product prices, Christmas card list, or personal records. The market hasn't stood still, and a number of developments are worth noting.

## Where the Market Stands

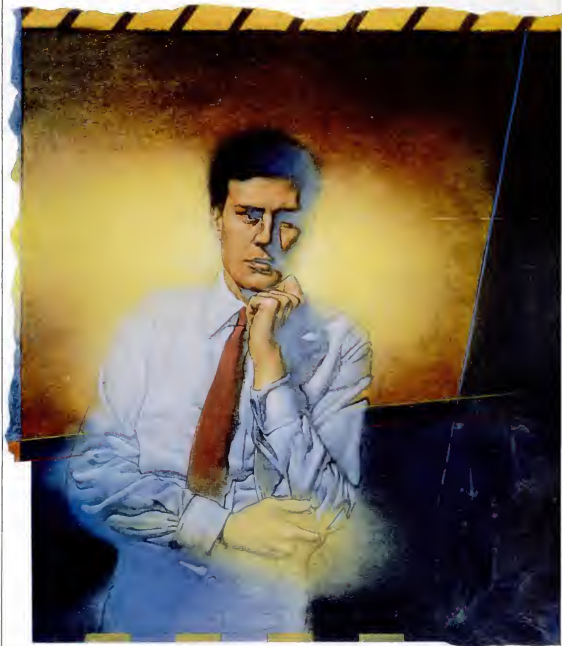
According to Mary McKee, senior analyst in the markets group at Future Computing in Dallas, nearly 2 million database programs were in use on all personal computers last year. This figure does not include pirated copies or copies bundled with other products, nor does it count database programs that people own but no

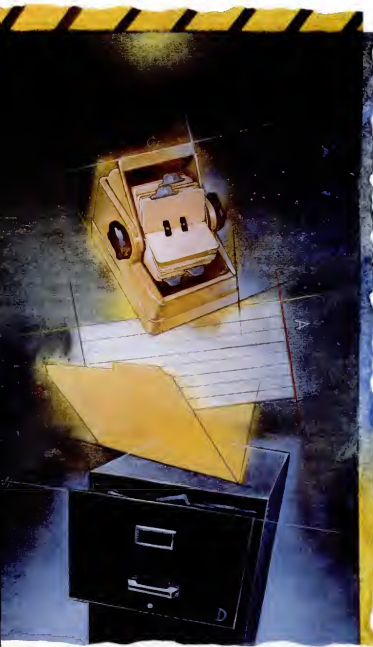
longer use. Still, according to Future Computing, market value sales for personal computer database programs were about \$240 million in 1984.

An informal survey of industry analysts, retailers, and publishers leaves no doubt about which database programs now dominate the marketplace. Ashton-Tate has a firm grip on the more complex category—*dBASE III* has become a top seller, and *dBASE II* still sells well. Software Publishing is doing well with its *PFS:FILE* and *REPORT* programs, and IBM's *Filing Assistant* is also a pick hit. Others that came up in the survey were Microrim's *R:BASE SERIES 4000*, MDBS's *KnowledgeMan*, *DATAEASE* from Software Solutions, *Power:BASE*, *PC/FOCUS* from Information Builders, and Alpha Software's *Data Base Manager II*.

## The Future

You can expect the best-seller lists to change in the future, the experts agree. According to McKee, nearly three out of four database programs sold this year will go to first-time computer users. In about 5 years, about two of every five packages will be purchased to replace the lightweight programs that no longer meet users' needs. Steve Ediger, director of acquisitions for Softeam, a Compton, California, distributor, points out that "people grow out of a product like





**PFS:FILE** pretty quickly. People still do not understand how to deal with database programs." He adds that publishers are still in the process of educating the buying public about their products.

You can also expect future releases to offer more functions at the same or lower cost. Higher-capacity machines and new mass-storage devices will make enormous databases a reality. In response, publishers will develop database software adapted to increased hardware capabilities and greater consumer demands.

Ediger feels that the key elements of future database products will be user interface, speed of performance, and database size. But as the programs grow fat, the database business is slimming down. Over 60 packages competed for a market share last year, but there are fewer than a dozen major players now. Mark Lilley, director of retail operations for the southern region of ComputerLand of Connecticut, agrees that "the whole market has calmed down" and points out that far fewer new database products were announced this past year than the year before.

McKee of Future Computing foresees a moderate but steady growth for database program sales over the next 5 years, about 14 percent per year (dollars of market value sales). This is about the same as the 13 percent growth forecast for word processors, and far greater than the 4 percent estimated for spreadsheets. Project management, graphics, and communications programs will be the fastest-growing packages (38 percent, 38 percent, and a whopping 58 percent per year, respectively), she says.

McKee makes another important point about the database program market. Many computer users are using "substitute products" to handle their database needs. Many spreadsheets, such as Lotus's 1-2-3, have limited data management functions that are adequate for some users. Integrated packages such as *Enable*, *Framework*, and *Symphony* offer another alternative to more-complex database programs. And, although the amount of data that spreadsheets and integrated packages can handle is restricted by the size of the machine's memory, the same hardware advances that will increase memory for database programs will apply.



## DATABASE UPDATE

### All for One, and One for All

Database programs are getting bigger, faster, and more powerful with each release, and in many cases they're also becoming easier to use. With greater storage capacity at a lower price, computer users are building larger databases than ever before.

If you build a massive database, however, a new constraint arises. If, for example, your files contain data on thousands upon thousands of customers, who will maintain the information? The fact is, a single operator can't be expected to maintain and update the database and still have time to produce the reports that the program was meant to supply in the first place.

One solution is to use a local area network (LAN), in which many computers are hooked to a central hard disk where they can share a common database. With a LAN system, more than one operator can update and query records in the database while others produce reports based on the same data.

Unfortunately, most database programs are not designed to work on a local network. Some programs won't even run when two computers try to use them at the same time; the different program modules load at different times, causing conflicts that crash the whole operation. Other packages load all the program code into memory at once and run normally until two machines try to access the same record (or even the same file) at the same time, at which point data loss or a system freeze occurs.

Another problem with LAN installation is that software is generally licensed for use on only one machine at a time. You might argue that a LAN is in fact a single computer system, but a case can be made for requiring each computer to have its own licensed copy of the program.

### Meeting Multiple Needs

Software publishers will leave no market untapped, and they are already responding to the needs of LAN users. Local area network versions of database programs and site licenses are two recent developments in the industry.

*MetaFILE* from Metafile Information Systems, *reQuest* from System Automa-



tion Software, Inc., and *Revelation* from Cosmos, Inc. are just three of the database packages available for LAN systems. And MDBS plans to have a network version of *KnowledgeMan* ready this spring.

Site licenses, which have been around for a while in the mainframe world, are now showing up in the micro market. Under a site license, a company pays a large, flat fee for the right to produce multiple copies of a software program for use within the company. This cuts costs for the publisher, who doesn't have to produce all the manuals and market the individual packages, and some of these savings are passed on to the buyer.

Market analysts say that interest in site license agreements is growing, on the part of database buyers and sellers alike. Such agreements have already been negotiated for some word processing and spreadsheet programs, but there are few if any for database yet. It also appears that publishers are negotiating these deals on a company-by-

company basis, so a standard for price comparison is hard to come by.

### Do You Need a Database Program?

According to Future Computing, more than 300 million dollars will be spent this year on database programs. Will your dollars be part of the total? How can you be sure your money is well spent?

Computer programs are simply tools, and it's common sense to choose the tool that best suits the task at hand. Pick a program that is as complex as necessary for your application.

A program that's too simple may require more work on your part than it's worth. On the other hand, a program that is too complex may bog you down as you try to learn how to make use of its myriad features.

Can the program make the task of data entry easier for you? Many programs give you ways to verify that a given entry is in the proper format or within a specific range



of values. Some can automatically calculate the number of days between two dates. Some provide a variety of levels of password protection to keep data secure. Decide which of these two factors are important to you.

Be sure the program will work with others that you already use, if you want to avoid re-entering data. If you intend to use the database program as a mailing list to merge with form letters from your word processor make certain that you can produce merge lists that will work. You may also want to edit database reports with your word processor or plug them into a spreadsheet for forecasting purposes; can the program produce formats that these other programs will understand?

Expect that your needs will change and grow. What happens to your data when you want to add more fields to each record? Some programs don't allow you to do this without retyping all the data. Will you be using all the program's capabilities from the start, or can it grow with your needs?

### Alternatives

Of course, you may not need a database program at all. An integrated package, spreadsheet, or word processor may be able to serve your needs just as well, or better.

For instance, if you have to maintain a catalog of items or a bibliography, your word processor may be all you need. Lists like these are generally kept in one sequence, such as alphabetical order. They also tend to have fields of widely varying length, which can be inefficient when it comes to storing your data. With a word processor, you can simply keep a single field with all the items in their proper order. If you need to add or remove an item, you just insert or delete it at the appropriate point in the list. However, if you need to sort the list into different orders or extract records based on certain criteria, a database would be a better choice.

Spreadsheets can also help you manage lists of data, and many will even let you change the order of the lists. The advantage of spreadsheets is that they are generally easy to set up and work relatively quickly. You can change one record and see the effect on the entire list. The prob-

lem with a spreadsheet is that you give up much of the formatted data entry, error checking, and reports available with a database program, and all of your data must fit within memory.

Integrated programs such as *Framework* and *Symphony* give you direct connection to word processing and spreadsheet programs so that you can more flexibly manage and work with your data. Unfortunately, these programs tend to have relatively unsophisticated database capabilities and, like spreadsheets, they can only handle as much data as fits within memory. If you have large database requirements, then spreadsheets and integrated packages are probably not for you.

### PC's Database Categories

Project: Database divided all database programs into four categories. Category 1 covers those programs that can only handle simple "one-to-one" data relationships; they are often referred to as "file managers" or "Rolodex-type" programs.

Category 2 programs must be able to handle "one-to-many" relationships. The simplest of the Category 2 programs do this by letting you build small "lookup" tables; others let you link two or more separate files. Category 2 programs must also have a way to search within the database for records that meet certain criteria—for instance, you can select those employees who work in Accounting and earn more than \$20,000.

Category 3 programs build on the capabilities of Category 2, adding the ability to use a procedural language that lets you automate sequences of commands for procedures that you will want to execute repeatedly. For example, you might want a procedure that automatically posts new orders to the inventory and accounts receivable files at the end of each day. Procedural languages also often let you create customized menus so that the database user does not have to learn the program's commands; instead, he or she can simply follow your on-screen prompts, which in turn select procedures that automate the database management process.

Category 4 is reserved for the database elite: high-powered programs that go beyond complex data relationships and powerful procedural languages and add some-

thing new and outstanding. Perhaps such programs permit easy access to complex data structures or give you great flexibility in how you structure (or restructure) the database.

Following is a sampling of the new programs and updates that have been released in the past year.

## Please

Hayes is well known in the microcomputer market, but not for its database products. After a quick look at *Please*, you might agree that the company should stick to communications. (For a full review of *Please*, see "Say 'Please' to Get More," PC, Volume 3 Number 24.)

*Please*, a Category 1 database has a number of interesting features, some of which are usually found only on sophisticated and complex database managers, and others that are unique to this product. At the same time, it has some startling deficiencies.

As might be expected, *Please* lets your data work hand-in-hand with your Hayes modem. Call up a client's record on the screen, punch a key, and your modem will merrily dial the phone for you. (This is certainly an attractive feature, but it is already available as an inexpensive add-on through products like *Sidekick*.)

You also get password protection. You can specify up to three different passwords, each assigned to a different level of privilege. By making judicious use of this feature, you can control who can call up data, who can modify it, and who can erase it. You can also control access to reports through this password system. This is an unusual capability for a Category 1 program.

The manual is in a class by itself in terms of design. The dividers are made of slick, silver paper with faint lines and clever, full-color, airbrushed artwork. Blue and green ink is used to highlight portions of the text. There are few screen prints, but plenty of examples, along with straightforward and well-organized text help make the manual a solid support for the new user. The error messages in the appendix are accompanied by suggestions on how to

## DATABASE UPDATE

deal with the different situations.

On the other side of the coin, however, *Please* leaves you asking for more. One of the program's major problems is that you cannot change the database structure after you have started entering data. For example, if you want to add a new field, you have to go through all the trouble of creating an entirely new database and import the data from the old database into it. It can be done, but only by resorting to a tedious and outdated method. (*Please* does have four different import/export formats, and the manual includes instructions on how to use them with a variety of popular spread-

### *Please* Version 1.0

Hayes Microcomputer Products, Inc.  
5923 Peachtree Industrial Blvd  
Norcross, GA 30092  
(404) 441-1617

List price: \$349.95

Category: 1

#### User interface:

- Menu-driven? Yes
- Interactive commands? No
- Procedure files? No
- On-line help? Yes
- Use of IBM keyboard? Good
- Menu creation? No

Records per file: 16,000,000

Files simultaneously open: 1

Record types per database: 1

Fields per record: 99

#### Report flexibility:

- Column headings? Yes
- Multiple lines per record? Yes
- Calculated fields? Yes, per record and summary possible
- Subtotals? Yes, 3 levels, with page eject

Files per report? 1

Data import/export: 4 formats, including DIF and comma delimited.

Data entry screens: Fixed

Data field types: character, numeric, date/time, logical

Copy protection: No

Requires: 128K RAM, two disk drives, DOS 1.1 or later.

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sheet, database, and word processing programs.)

Another curious drawback is that you cannot define a calculated field in a file. You can enter data as the result of a calculation based on another field (or fields), but you must re-enter the calculation each time.

There are no facilities for customizing the program—you must work within the existing menu structure, and you can't create batch files to automate repetitive tasks. (There is a mass delete/change facility, however.)

*Please* is a relatively expensive package that is easy to learn and fairly easy to use, with an uneven combination of capabilities and limitations. Its communication capabilities are not enough to make it stand out from the crowd. You can find better bargains for single-file programs, and for the price of *Please* you can find a multiple-file program that is equally easy to operate. Please think twice before buying this program.

## Cornerstone

You have just entered a dark and empty database. Above you there are some commands and a highlighted cursor. Below you are some empty prompts. What is your next move?"

That was the greeting I expected when I first loaded *Cornerstone*, the first business program from Infocom. This company started with *Zork* and has since become one of the top producers of interactive fiction games. But in spite of its recreational relatives, *Cornerstone* is all business—except, of course, for the pin-on button in the box that warns: "Don't panic!"

It is an apt warning. Once you figure out how to open the trick latch on the plastic box it comes in, you find lots of pieces, including a few little pamphlets and three large manuals (averaging 200 pages each). How easy can this database be, if it's packing so much printed material?

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## DATABASE UPDATE

The answer is that it can be very easy. *Cornerstone* is one of the most powerful Category 2 programs around, but it's not at all difficult to put to work. It is entirely menu driven, and it assembles a command line showing the options that you have selected. You may highlight your menu choices with the arrow keys, type the first few letters, or type the whole command.

The same easy selection method works throughout the program. You can specify a field as being "enumerated," which means that it only accepts values that match a list of acceptable choices; type enough of the choice to make it unique, and the program will enter the rest for you. *Cornerstone* also understands English; it will calculate the correct date if you type "today," from the system date "yesterday," or even "last Tuesday."

Should you ever get lost, don't panic—press the F1 key for context-sensitive help that appears in a window that opens up in the middle of the screen. *Cornerstone* uses a similar windowing technique to display options, such as the list of enumerated values that are available for a given field.

*Cornerstone* lets you create custom screens and report formats. You have quick access to data on the screen and can quickly request sorts and/or selections (selection criteria can be saved for repeated use). The program lets you specify a vari-

ety of verification and formatting features for data fields, such as mandatory or unique.

Best of all, you can quickly connect two files through a common field, so that they can share data. This makes it possible to create complex data structures with little effort. You can design tables to perform lookups, and retrieve addresses, prices, or other useful information.

One of the three manuals is a tutorial that consists of interactive disks and exercises that use a sample database to illustrate the program's features. I found that I could get by just fine on the sample database exercises, but some people will appreciate the disk lessons, which show the commands at work in a controlled environment.

*Cornerstone* is not without drawbacks. With this much power, it would be nice if you could assemble some of those command lines in a file to be executed in a batch. Even Lotus's *1-2-3* lets you write macros to do this sort of thing. But with *Cornerstone* you always have to rummage through the menus to get anything done.

The manuals try so hard to be easy to read and use that they are too large. Breaking them into three separate volumes helps, and each of the two reference books has an index covering the contents of both. Still, they suffer from a fair amount of rep-

### Cornerstone 5.1

Infocom  
55 Wheeler St.  
Cambridge, MA 02138  
(617) 492-1031

List price: \$495  
Category: 2

#### User interfaces:

Menu-driven? Yes  
Interactive commands? No  
Procedure files? No  
On-line help? Yes  
Use of IBM keyboard? Fair  
Menu Creation? No

Records per file: 32,000

Files simultaneously open: 120

Record types per database: 1

Fields per record: 158

#### Report flexibility:

Column headings? Yes  
Multiple lines per record? Yes  
Calculated fields? Yes, per record  
and summary possible  
Subtotals? Yes, 1 level, with page  
eject

#### Files per report? 31

Data import/export: Export—1-2-3,  
MailMerge, DIF, SDF;  
import—dBASE II, PFS, ASCII

Data entry screens: Custom, painted

Data field types: Character,  
numeric, date/time, (with date math),  
logical

Copy protection: Yes

Requires: 256K RAM, DOS 2.0 or  
later, two disk drives, monitor.

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*Cornerstone* is very powerful, and it is entirely menu driven.

etition; perhaps they could be organized and written a bit more concisely.

But these are small complaints. Infocom throws in two full, ready-to-run applications: Client Tracking and Sales. If you want a program that can handle multiple files but are not ready to tackle a procedural language package (such as *KnowledgeMan* or *dBASE III*), *Cornerstone* should be near the top of your "check-it-out" list. Its combination of power and ease of use make it stand out from the crowd.

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## DB-FABS

Computer Control Systems, known in the past for its programmer's aids, now offers a new product: a Category 2 database called *DB-FABS*. What sets *DB-FABS* apart from other databases is that it aims to be both easy enough for novices to operate, yet powerful enough to satisfy experienced programmers used to working in BASIC.

While its attempt to fulfill these twin purposes creates some limitations, *DB-FABS* does manage to meet its promise fairly well. However, it does this by developing a dual personality: Two versions of the program—standalone and run-time—are supplied on the same disk.

In the standalone version, *DB-FABS* is a command-oriented system. It gives you multiple data screens and indexes for individual files; in addition, it lets you access up to 16 combinations of these files, screens, and indexes with a simple *USE* command. You can paint data entry forms on the screen or list data to the screen, printer, or a disk file. It is fairly easy to link two files in order to build more complex applications. Unfortunately, the standalone version's major drawback is that, except for storing report formats, it contains no way to automate commands: Each command must be typed in at every step.

In some respects, the run-time version seems more an extension of the BASIC commands than a separate version of the program. Necessary for more sophisticated work such as creating a customized system to automate repetitive tasks, it uses procedural files that require BASIC or compiled BASIC. These procedural files let you call the database program modules through a variety of additional run-time commands. Using them frees a programmer to focus on more demanding programming tasks while letting *DB-FABS* handle the tedious work of screen management and data file control.

Most users will probably want to focus on the standalone version, which is fairly easy to learn. Although the user interface is a bit rough—all you have to go on is a "Cmd?" prompt—there is on-line help. Calling it presents a menu of topics from which to select. You can also get an expla-

nation and an example of the usage for each command.

The actual documentation, however, is uneven. On the plus side, the reference section is nicely organized and lists each command in alphabetical order. On the minus side, there is no list of error messages and no index. The manual, which appears to have been produced on a daisy-wheel printer, makes little use of visual cues that could help make its contents easier to digest. It has screen printouts, but no actual screen shots and, outside of the tutorial, few examples of how the program works. The tutorial itself—a concise 30-page section—glosses over a few important details but does introduce you to most of the program's capabilities.

**DB-FABS has a dual personality. Two versions of the program, standalone and run-time, are supplied on the same disk.**

Surprisingly, the program is not very robust. I managed to crash it in a number of ways, including making a typo in the filename when defining a condition. The only way to recover was to do a system reset. Even worse, I was able to create a file containing an illegal field name, then could never get at the data I put in that field.

On the other hand, the program is fast. Three separate data import/conversion utilities let you import data from a BASIC random-access file (which you can create from a *DB-FABS* data file), a *dBASE II* file, and a comma-delimited file in which the string fields are indicated in quotation marks (""). Using one of these utilities, it took me only seconds to import a 500-record file. Though the file couldn't be used until I rebuilt the index, that step took only about another 30 seconds. Compared to other programs that take as long as half an hour to import the same 500 records, *DB-FABS* is a speed demon.

Another utility lets you assign certain commands to whichever function keys you

want. Even so, you can go beyond that with a command that permits you to assign macros containing up to 200 keystrokes to any function key you wish. (At last you can use all those Ctrl-function, Shift-function, and Alt-function key combinations.)

To sum up, *DB-FABS*—fast and versa-

### DB-FABS 1.15B

Computer Control Systems, Inc.  
298 21st Terrace S.E.  
Largo, FL 33541  
(813) 586-1886

List price: \$295

Category: 2

#### User interface:

Menu-driven? No  
Interactive commands? Yes  
Procedure files? No (BASIC Language interface)  
On-line help? Yes  
Use of IBM keyboard?  
Reprogrammable keyboard  
Menu Creation? No, except through BASIC

Records per file: 65,535

Files simultaneously open: 10

Record types per database: limited by disk space

Fields per record: 64

#### Report flexibility:

Column headings? Yes  
Multiple lines per record? Yes  
Calculated fields? Yes, per record and summary possible  
Subtotals? Yes, 1 level, with page eject

Files per report? 10

Data import/export: Import—ASCII, dBASE, comma delimited with quotes around strings; export—BASIC random data files.

Data entry screens: Painted

Data field types: Character, numeric, fixed decimal

Copy protection: No

Requires: 192K RAM, two disk drives.

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tile, yet touchy about how it is handled—manages to live up to most of its claims. However, I hesitate to recommend it to anyone who doesn't have time to "play" with the program while learning to use it. Though experienced programmers are not likely to have trouble, it is a bit too sensitive for the typical end user.

## reQuest

Most people will say either that a database management program is easy to use or that it's capable of complex tasks, but seldom both. *reQuest* from System Automation Software shows that a database program can be both sophisticated and relatively easy to operate. The catch is that it's slow and cumbersome—a high price to pay for the best of both worlds.

Some sluggishness is normal in a program that comes on seven disks. However, the myriad steps that sometimes result are another question. Taken by itself, each step is simple; but a procedure may require so many that the complexity becomes an impediment in itself. For example, you can create fancy screens and report formats using the IBM extended character set to draw boxes and other figures. But it might take more than 80 keystrokes to draw a simple box on the screen. Similar complexity characterizes many of *reQuest*'s other capabilities.

*reQuest* is menu driven and does not have a procedural language, which places it in Category 2. It can create customized menus and can also automate repetitive tasks by passing control from one module to another. However, to create or modify a customized menu, you must use an external text editor such as EDLIN. Though this sounds complex, you can simplify the process by having one menu call another, presenting a nearly unlimited number of options that have been prepared in advance. Note that if you change modules by going back to the main menu, you must re-enter your user name and password every time.

Where earlier versions had always required you to return to the main menu, the current version lets you "jump" directly from one module to another in certain cases. Still, the installation procedure in

my test version put the main menu on a key floppy disk that had to be accessed every time, even when running on a hard disk. When I asked the company about this afterwards, I was assured that since the program is not copy protected, the floppy disk should not be required.

*reQuest* has some nifty features. One is a password protection scheme that lets you assign up to ten different security levels, then control the read/write access to each individual field separately. The passwords are case sensitive: If the password is in capitals, a lowercase response will not be accepted ("PASSWORD" does not equal "password").

The two situations in which *reQuest* makes you use a text editor are building customized menus and creating password files. To add new users and passwords to your system, you must first create a text file, then process it through a utility. Don't forget to archive off the original text file and remove it from the hard disk; otherwise, anyone can type out the password file and see the list of names and passwords.

When you are defining a data entry screen, you can call up a list of available field names from the data dictionary. Highlight the one you want, press the Enter key, and the information is automatically entered in the appropriate blanks.

Typing a few letters of the field name will present you with a smaller list: just the fields beginning with those letters. Since the field names can be 32 characters long and can include spaces, this feature is a big help.

Edit masks, levels of security, and other validation details may be specified, and if you need to create a different field with the same characteristics, you can easily clone duplicates. There is a flow to the program; you define your data dictionary first, create your forms, do a search definition and report format. Only then are you ready to see a printout of your data.

*reQuest* makes some use of the IBM keyboard, and a function key template would make it easier. *reQuest* differs from many programs by not using the Enter key to advance the cursor in many cases but instead accepts the data as entered at that point. I often found myself on the next screen before I was ready because I had accidentally pressed Enter.

The manuals are not well organized; the index consists of a few stapled sheets in the reference section. There is no index for the tutorial, but given the inaccuracies and skimpy coverage in the index to the reference section, it may not be much of a loss.

It is a shame that the program is so slow, since it does make the task of linking files easy. *reQuest* can also be used in a local area network (the licensing agreement



*reQuest* is both sophisticated and relatively easy to operate, but it's slow.

permits installation on a single network.) The program offers good security, both because of its password protection scheme and because it does not allow data files to be viewed with the TYPE command. Also, its menu creation feature offers plenty of flexibility for customizing a program. *reQuest* does provide a good combination of sophisticated skills, but it is suited to only the most patient users.

#### reQuest

System Automation Software  
8555 Sixteenth St.  
Silver Spring, MD 20910  
(800) 312-DBMS

List price: \$695 Single-user, \$1,495 multi-user

#### Category: 2

#### User interface:

- Menu-driven? Yes
- Interactive commands? No
- Procedure files? Custom menus only
- On-line help? Not context sensitive
- Use of IBM keyboard: Fair
- Menu Creation? Yes

Records per file: 65,000

Files simultaneously open: 100

Record types per database: 5

Fields per record: 255

#### Report flexibility:

- Column headings? Yes
- Multiple lines per record? Yes
- Calculated fields? Yes, per record and summary possible
- Subtotals? Yes, 8 levels, with page eject

Files accessed per report? 7

Data import/export: Import—only fixed-length ASCII, no field delimiters required, but carriage return record delimiter required; export—text file, *WordStar*, *Multiplan*, or 1-2-3 formats.

Data entry screens: Custom, painted

Data field types: Character, numeric, dollar, date (with date math)

Copy protection: No

Requires: 384K RAM, DOS 2.0 or later, two disk drives.

CIRCLE 677 ON READER SERVICE CARD

## SSIData

Satellite Software International, publishers of the popular word processor *WordPerfect*, now bring you *SSIData*, an imaginative Category 2 database with a dull name. Clearly, a great deal of effort went into designing the user interface in an attempt to make complex data structures easy to handle. The data entry screen is divided into three sections; the bottom third of the screen displays window-like "panels" that show the contents of individual records and can be linked to one another through common fields. You can choose to make these panels overlap, creating some interesting visual effects on the screen.

A good on-line facility provides context-sensitive prompts—you can even create prompts that are specific to your application. It should come as no surprise that this program also allows you to enter free-form text. If you define a field as a text field, you can enter up to 4,000 characters of information: about two full screens. (*SSIData*'s text fields are similar to the memo fields in *dBASE III*.) The words wrap at the end of the line, and some limited editing functions are available.

The only way to interact with *SSIData* is through its command keys, which are

labeled clearly on a function key template. You cannot create procedures or custom menus to automate repetitive tasks. I found it difficult to get the hang of the cursor control on the data entry/edit screen; I was never sure which panel or portion of the screen I was going to jump to next. The program does let you scroll through a file by a given field and pull up an entire record by highlighting the one you want.

The program's report writer allows you to create, edit, and recall report formats for your files. You can use headers and footers, have multiple records on a single line (as in 3-up mailing labels), and compute an average, minimum, maximum, or total for any field.

The report writer was added in Version 1.1 of *SSIData*. According to the company, this version also improves lookups, using the index so that the program runs as much as twice as fast as the original.

The program's slick manual, with high-quality typesetting and graphics, has lots of screen prints and plenty of examples. You get a selection of sample databases on the disk, so you can see how the files are set up and used. I found the program's tutorial to be rather slow, but it does step you through all the important features and shows how to use a system involving multiple files.

SSIDATA V1.100
04/29/85 10:19

(Beginning)

Auto	01	\$45.00
Food	01	\$120.55
Insurance	01	\$8.00
Utilities	01	\$8.00

Checkbook

#	Account	Check	Deposit	Transaction
01	Auto	01, 321	08/03/84	04/29/85

Other

CHICKBOOK T-1

Checkbook Number	01
Balance	\$1,069.01

ACCOUNTS T-4

Account	Auto
Chk #	01
Balance	\$45.00

Number
 01, 321 | Date | 08/03/84 | Account | Auto | Amount | \$45.00 |

To Joe's Garage

REPORTS T-1

Date	08/03/84	Checkbook Number	01	Amount	\$1,234.56
From	Initial Balance				

OTHERS T-2

Date	04/29/85	Account	Auto	Amount	\$8.00
To					

*SSIData* requires too much effort to create complex, multiple-file databases.

# Behold!

✦ denotes IBM-AT compatibility.

## SOFTWARE

We only carry the latest versions of products. Version numbers in our ads are current at press time

<b>Aptec</b>	
✦Rainbow Writer Color Text Formatter 2.1	\$119
✦Rainbow Writer Screen Grabber 1.1	69
✦ColorScreenPrint 2.0	59
<b>Ashton-Tate</b>	
✦dBase II 2.43	call
✦dBase III 1.1	call
✦Framework 1.1	call
<b>Best Programs</b>	
✦Personal Finance Programs 1.1	65
✦PC/Professional Finance Program II 3.0	149
✦PC/Fixed Asset System 3.0	329
✦PC/Tax Cut (for 1984 taxes)	special
✦PC/Personal (Level 1) 3.0	279
✦PC/Personal (Level 2) 3.0	419
✦PC/Personal (Level 3) 3.0	559
<b>Bible Research</b>	
✦THE WORD 1.0 (KJV Bible)	145
<b>Borland International</b>	
✦Sidekick 1.5 (non-protected)	49
✦Turbo Pascal 3.0	37
✦Turbo Pascal 3.0 w/BCD	59
✦Turbo 8087 3.0	59
✦Turbo 8087 3.0 w/BCD	72
✦Turbo Toolbox 1.0	30
✦Graphics Toolbox 1.0	30
✦Turbo Tutor 1.0	19
✦Superkey 1.0	37
<b>Broderbund</b>	
✦Bank Street Writer	49
<b>Continental</b>	
✦Home Accountant Plus 1.5C	89
✦The Tax Advantage (for 1984 taxes)	39
<b>Digital Research</b>	
✦GEM Desktop 1.1	special
✦GEM Draw (includes GEM Desktop)	special
<b>Financier</b>	
✦Financier II 2.1	special
<b>FriendlySoft</b>	
✦FriendlyWriter 2.0 (with FriendlySpeller)	55
<b>Funk Software</b>	
✦Sideways 2.11	39
<b>Harvard Software</b>	
✦Harvard Project Manager 1.1	209
✦Harvard Total Project Manager 1.0	279
<b>Hayes</b>	
✦Smartcom II 2.1	89
<b>Infocom</b>	
✦Comerstone	289
<b>Lifetree</b>	
✦Volkswriter Deluxe 2.1 (with TextMerge)	159
✦Volkswriter Scientific 1.0	289
<b>Living Videotext</b>	
✦ThinkTank 2.0	109

## PC Connection Software Special

### What! No software special???

Now don't jump to any hasty conclusions. We know that you're used to finding a low-priced software package in this space every month. Well, now you can get used to finding a whole page of specials. Where are they? Just flip to the preceding page.

There you'll find not one, but four software specials—on Financier II, GEM Draw/GEM Desktop, and WordPerfect. We even have the full Tax Cut for the unbelievable price of \$49!

### Micro Education (MECA)

✦Managing Your Money 1.52	\$99
✦Running Program (Jim Fox) 1.2	49

### Micro Data Base

✦KnowledgeMan 1.07	249
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### Micropro

✦WordStar 3.31	179
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Hard disk recommended for Wordstar

✦WordStar 2000 1.01	259
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✦WordStar 2000 Plus 1.01	299
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### Microsim

✦R-base 4000 1.15	259
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✦R-base 5000 1.0	369
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✦Upgrade Kit to R-base 5000	129
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✦Extended Report Writer 1.2	85
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✦Clout 2.0	135
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### Microsoft

✦Multiplan 1.2	125
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✦Microsoft Spell 1.0	30
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✦Microsoft Word 2.0	239
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✦Microsoft Mouse with software 3.0	135
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✦Microsoft Serial Mouse with software 3.0	135
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✦Microsoft Project 1.01	155
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✦Microsoft Chart 1.01	155
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### Microstar

✦Crosstalk XVI 3.5	99
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✦InfoScope 1.0	149
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✦Transporter 1.5 (includes Crosstalk)	169
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### Multimate International

✦MultiMate 3.3	call
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### PC Software

✦PCCrayon II	39
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✦Executive Picture Show	139
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✦CREATBASE	47
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### Peter Norton

✦Norton Utilities 3.0	59
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### Powerbase Systems

✦Powerbase 2.1	call
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### Rosesoft

✦Prokey 4.0	89
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### Satellite Software

✦WordPerfect 4.0	special
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### Software Group

✦Enable 1.1	call
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### Software Publishing

✦PFS Access C 00	84
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✦PFS File B 01	84
----------------	----

✦PFS Graph B 01	84
-----------------	----

✦PFS Plan A 01	84
----------------	----

✦PFS Proof B 00	59
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✦PFS Report B 01	77
------------------	----

✦PFS Write B 01	84
-----------------	----

### Virtual Combinatics

✦Micro Cookbook	29
-----------------	----

### Warner Software

✦The Desk Organizer 2.0	59
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✦Xanero	289
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## TRAINING

### ATI

#### SKILL BUILDER PROGRAMS

Intro and How To Use	
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Word Processing	MS-DOS (2.0)
-----------------	--------------

Business Software	PC-DOS (2.1)
-------------------	--------------

Data Bases	Home Accountant
------------	-----------------

Compaq	VW Deluxe
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Basic	TKI/Solver
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IBM PC	each 32
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#### TRAINING POWER PROGRAMS

How to Use:	
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dBase II	dBase III	Lotus 1-2-3
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MS Word	Easywriter II	Multimate
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Multiplan	Supercalc 3	Framework
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Symphony	Wordstar	each 49
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### Comprehensive Software

Intro to Personal Computing	39
-----------------------------	----

Intro to Databases	39
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Intro to Communications	39
-------------------------	----

Intro to the Operating System (PC Tutor)	39
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### Individual Software

✦The Instructor II (all new!)	35
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✦Professor DOS	47
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✦Tutorial Set (both items above)	75
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✦Professor Pixel	47
------------------	----

✦Typing Instructor	39
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### Scarborough Systems

Master Type	35
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## EDUCATIONAL

### Digital Research

Diagnostic Test (PSAT)	14
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OwlCat SAT (15 hour)	63
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OwlCat SAT (60 hour)	169
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### FriendlySoft

✦FriendlyWare/PC Introductory Set	35
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### Spinnaker

Educational Games for Young Computer Users (All require graphics board)	
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Delta Drawing (ages 4 to adult)	34
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✓RX-100	call
✓FX-80 Plus	call
✓FX-100 Plus	call
✓X-80	call
✓Q-1500 (letter quality dot matrix)	call
✓Printer to IBM Cable (specify printer)	27
<b>FTG Data</b>	
✓Light Pen (Push Tip)	195
✓Demo Disk Set for Light Pen	39
<b>Hayes</b>	
✓Smartmodem 300	149
✓Smartmodem 1200	429
✓Smartmodem 1200B (w/Smartcom II)	369
✓Smartmodem 2400	call
✓Smartcom II 2.1	89
✓CompuCable's	
Smartmodem-to-IBM Cable	25
<b>Hercules Computer</b>	
✓Hercules Graphics Card (parallel port)	309
✓Hercules Color Card (parallel port)	169
✓Graph-X Software	42
<b>Kensington Microware</b>	
✓Masterpiece	97
<b>key tronic</b>	
Deluxe keyboard (KB 5151)	169
<b>Kraft</b>	
✓Joystick	35
<b>Maynard Electronics</b>	
Floppy Drive Controller	119
<b>Mouse Systems</b>	
✓PC Mouse (w software pad & PC Paint)	139
<b>NEC</b>	
✓Pinwriter P2-3 (IBM, 80 column)	559
✓Pinwriter P3-3 (IBM, 132 column)	759
✓Spinwriter 2050 (3550's little brother)	679
✓Spinwriter 3550 (IBM-PC compatible)	1099
✓Spinwriter 8850 (IBM-PC compatible)	1489
<b>Orchid Technologies</b>	
All Orchid Boards come with PCNet Drive (Ram disk) PCNet spool (print spooling) disk caching & partitioning	
Blossom 64k upgradeable to 384k, with clock calendar, serial and parallel port	229
PCNet Daughter Board (piggybacks to Blossom) with version 3.0 networking software	call
PCNet Blossom 64k Blossom Board with the Daughter Board installed	call
PC Turbo 16/6 w/ 128k	call
PC Net (stand alone card)	call
<b>Paladin</b> - See VisiCorp	
<b>Paradise Systems</b>	
✓Modular Graphics Card	275
✓Multidisplay Card	289
✓5-Pack (w/ 1K expandable to 384k) w clock and serial port	169
<b>Princeton Graphics</b>	
✓HX-12 RGB monitor (690 x 240)	call
✓MAX-12 Amber monochrome monitor	call
✓SR-12 RGB monitor 680 x 480	call
✓Scan Doubler Board for SR-12	call

<b>Quadram</b>	
Quadboard 64k expandable to 384k with clock calendar parallel serial & game port. I/O bracket and Quadmaster software	special
✓MicroLaser Printer Buller (parallel) w copy MP 64 (64k) upgradeable to 512k	159
✓Quadcolor I	197
✓Quadchrome RGB Monitor	469
✓Quadchrome II	449
<b>SMA (Systems Management)</b>	
PC-Document Keyboard Templates available for	
DOS Basic 1.1	Supercalc 3
DOS Basic 2.0-2.1	Wordstar
Lotus 1-2-3	Turbo Pascal
Symphony	WordPerfect
Multipian (IBM)	dBase II
Multipian (Microsoft)	dBase III
Peashtext 5000	Framework
Easywriter II	Multimate
Volkswriter Deluxe	each 12
<b>Toshiba</b>	
✓P351 printer	call
✓P1340 printer	call
<b>VisiCorp</b>	
✓Visi Mouse (2 button Mouse Systems mouse, PC Paint & pop-up menu software)	special
<b>WICO</b>	
✓Joystick	35

## DRIVES

All floppy drives are completely pre-tested and are supplied with a printout of the test results. They are shipped with complete step by step installation instructions. Drives are 320k/360k.

**Control Data (CDC)**

(5 1/4") half-height drive (DS,DD) special

(5 1/4") full-height drive (DS,DD) special

Free mounting bracket with each pair of half-heights

<b>IOmega</b>	
✓Bernoulli Box 20 Meg	\$2549
✓10 Meg cartridge	48
<b>Maynard Electronics</b>	
Internal Hard Disk (10 Meg) with WS-1 Controller	797
Internal Hard Disk (10 Meg) with WS-2 Controller	969
<b>Tandon</b>	
TM 100-2 (5 1/4") full-height drive (DS,DD)	109
10 Meg Internal hard drive w/controller (complete package)	special
<b>TEAC</b>	
FD-55B (5 1/4") half-height drive (DS,DD)	109
Free mounting bracket with each pair of half-heights.	

## MEMORY

64k Memory Upgrade Set for IBM-PC or XT system board.	12
64k Memory Upgrade Set for any memory board specify make of board	12
Install memory upgrades & run diagnostics at time of board purchase only	10.

## DISKS

<b>Fuji</b>	
✓Disks for IBM-AT (96 TPI) Box of 10	39
<b>MAXELL</b>	
✓Disks for IBM-AT (96 TPI) Box of 10	45.
<b>Verbatim</b>	
Datalife Disks SS/DD Box of 10	21
Datalife Disks DS/DD Box of 10	25
Disk Drive Analyzer	19
✓Flip Sort (holds 75 disks)	19

## INFORMATION SERVICES

<b>Compuserve</b>	
✓Compuserve Information Service (includes subscription, manual, 5 hours of connect time, monthly publications)	19
<b>Source Telecomputing</b>	
✓The Source (subscription & manual)	39.

## Still Kicking.

Has IBM's recent announcement about the PCjr. left you feeling like you're upstream without a joystick? Never fear. Just because they've eliminated the little micro doesn't mean JR CONNECTION's going to roll over and play dead. We're committed to our junior customer.

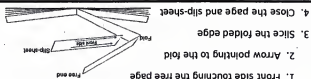
We'll continue to offer low prices on lots of products, with great support.

So keep on calling junior specialists at JR CONNECTION. 1-800/IBM-jrPC or 603/446-7761. They can help you with all your junior add-on and software needs.

## 1-800/IBM-jrPC

CIRCLE 339 ON READER SERVICE CARD

# PC CONNECTION®



4. Close the page and slip-sheet

3. Slice the folded edge

2. Arrow pointing to the fold

1. Front side touching the free page

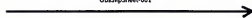
2. Insert this sheet with

1. Open the foldout page

Inverted Foldout slip-sheet



GbxSlipSheet-001



Foldout slip-sheet

Folded edge of the page

1. Open the foldout page

2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5ip8ack-0018

Back

1. Follow instructions on the other side



# Bold bargains, bet

Snooper Troops I (ages 10 to adult) .	\$30
Snooper Troops II (ages 10 to adult) .	30
Most Amazing Thing (ages 10 & up) .	27
President's Choice (ages 13 to adult) .	27
Face Maker (ages 3 to 8) .	23
Kids on Keys (ages 3 to 9) .	23
Story Machine (ages 5 to 9) .	23
Fracture Fever (ages 7 to adult) .	23
Kinder Comp (ages 3 to 8) .	20
Rhymes and Riddles (ages 5 to 9) .	20
Hey Diddle Diddle (ages 3 to 10) .	20
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There you'll find three hardware specials — new low prices on Vsi Mouse, 1/2 & full height drives by CDC, Tandon's 10 meg drive, and the Quadram Quadboard. So be sure to check out our new specials page, featuring our omnipresent mascot in a positively patriotic pose

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# 1-800/243-8088

**PC Connection** 110M  
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603/446-3383

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All AST Boards come with SuperDrive, SuperSpool, and one year warranty. **SxPakPlus** 64k upgradeable to 384k, with clock calendar, serial and parallel ports (game port optional) \$249  
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**MegaPak 128k** (not upgradeable) 209  
**MegaPak 256k** 399

**IO Plus II** with clock calendar and serial port (parallel, game, or second serial port optional) 125

**Parallel, Game, or second Serial Port** for any AST board (specify board) 35

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**AST-S251-11** 709

**AST-3780** 589

**Reach Modem** (half card 300/1200 baud internal modem includes Crosstalk XVI) 389

**Advantage 128k** 399

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**Video 310A monitor (amber)** 179

**Color 600 - RGB monitor** 399

**Color 700 - RGB monitor** 439

**CompuCase**

**Plastic Keyboard & Drive Cover Set** 17

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**Comrex**

**Comrex 420 printer** (417 cps draft mode, 100 cps letter quality) call

**Curtis**

**STANDS**

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**Diamond** (6 outlets) 33

**Emerald** (6 outlets, 6 ft cord) 43

**Sapphire** (3 outlets, EMIRFI filtered) 53

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For the IBM-PC Exclusively.

# PC CONNECTION®

*SSiData* has a fairly sophisticated set of data import and export facilities. It can handle *WordPerfect* merge and DIF formats and most any character-delimited ASCII file. For the ASCII files, you can choose which fields you want to import to which fields in your database, and in what order; you need not import all of them.

Overall, it takes more effort than it's worth to produce complex, multiple-file databases. The program's inability to create batch procedures is a serious drawback. On the other hand, if you're looking for a reasonably powerful program to go along with *WordPerfect* to create merge lists, *SSiData* is well worth the effort of learning to master it.

#### **SSiData Version 1.1**

Satellite Software International  
288 West Center St.  
Orem, UT 84057  
(801) 227-4040

**List Price:** \$195

**Category:** 2

#### **User interface:**

Menu-driven? Yes  
Interactive commands? No  
Procedure files? No  
On-line help? Limited  
Use of IBM keyboard? Good  
Menu creation? No

**Records per file:** 65,000

**Files simultaneously open:** 200

**Record types per database:** 1

**Fields per record:** 60

#### **Report flexibility:**

Column headings? Yes  
Multiple lines per record? Yes  
Calculated fields? Yes, per record and summary possible  
Subtotals? Yes, 2 levels, pg. eject  
Files accessed per report? 200

**Data import/export:** *WordPerfect* merge, or delimited files.

**Data entry screens:** Custom, semi-painted

**Data field types:** character numeric, fixed decimal dollar, date

**Copy protection?** No

**Requires:** 128K RAM.

**CIRCLE 672 ON READER SERVICE CARD**

## **VersaForm XL**

If you're searching for evidence of increasing software capability at a lower cost, look no further than *VersaForm XL*. This program is an unprecedented combination of high power and low price.

A look at *VersaForm XL*'s features shows clearly why it belongs in Category 3 with some heavyweight products. It has a full procedural language and can handle two files at the same time (as can *dBASE II*). It allows up to 90 fields per record and provides a broad range of predefined field types. You don't have to use the procedural language if you don't want to; *VersaForm XL* also has a menu-driven mode that you can quickly put to work.

*VersaForm XL* is a breeze to install; just copy the two disks and go. The first time you run the program it configures itself, which takes a minute or two. After that, it takes less than 10 seconds to load and run. The documentation is a little difficult to get used to—it includes the manual for *VersaForm* (a less powerful program) and a separate supplement for *VersaForm XL* that explains the differences. (There are some internal conflicts between the two, which can be disconcerting.) A catalog/newsletter and a command cue card, neither of which were especially helpful, are also included.

The tutorial in the manual works with some sample files on the disk and takes about a 1/2 hour to complete. As you work with the exercises, you discover some good and bad points about the program.

One real plus is that your data entry screen can be set up with columnar fields. On an invoice, for example, you may want to have multiple entries under Quantity, Part Number, Description, and Cost. *VersaForm XL* lets you set up such headings; the program will create multiple lines under the field headings as needed. Other nice features include lookup tables without programming, some date-math capabilities, and even a field type that computes a checksum digit to check its own validity.

*VersaForm XL* is not without its drawbacks, however. The user interface can be a bit awkward. For example, when selecting options from a menu, you may use the arrow keys to move a highlighted cursor

#### **VersaForm XL 3.12**

Applied Software Technology  
1350 Dell Ave.  
Campbell, CA 95088  
(408) 370-2662

**List Price:** \$99

**Category:** 3

#### **User interface:**

Menu-driven? Yes  
Interactive commands? No  
Procedure files? Yes  
On-line help? Limited  
Use of IBM keyboard? Good  
Menu creation? Yes, through procedure files

**Records per file:** Unlimited up to 4 million characters

**Files simultaneously open:** 2

**Record types per database:** 1

**Fields per record:** 90 plus up to 99 repetitions

#### **Report flexibility:**

Column headings? Yes  
Multiple lines per record? Yes, with columns feature or procedure  
Calculated fields? Yes, per record and summary possible  
Subtotals? Yes, 3 levels, pg. eject  
Files per report? 1

**Data import/export:** DIF import, DIF, *Multiplan*, *WordStar* export  
**Data entry screens:** Custom, painted

**Data field types:** Character, numeric, fixed decimal, dollar, date/time (with date math), logical.

**Copy protection:** No

**Requires:** 256K RAM, DOS 2.x, hard disk, and one floppy drive.

**CIRCLE 671 ON READER SERVICE CARD**

around, but pressing the Enter key merely advances the cursor to the next option; you must press the X key to make your selection. Also, the menu prompt for many of the screens is a cryptic list of unidentified letters. This is probably an artifact of the program's 8-bit heritage, but most PC users expect more help from their programs.

Editing data is not easy. It's difficult to reverse direction to go back to a previously

## Drive your PC to distraction!



O'kay all you PC owners who've been waiting for a hard drive under \$500.

Your time has come. We'll sell you Tandon's 10 Meg. internal hard drive, along

with Western Digital's controller board for \$479! This complete package lets your PC act like an XT, even letting you boot off the hard drive! Ready to install, with a full one year warranty.

**\$479** Tandon 10 Meg. Internal Drive Package (PC, XT)

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**\$89** CDC half-height drive

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## Don't overtax yourself.



Isn't selling a tax program/planner after April 15 like selling umbrellas in the desert? Not if you got an extension till August 15. Or if you want to plan now to save money

next year. Software Digest called PC/TaxCut the #1 tax calculating/planning program. We usually sell it for \$123, but we saved so much using it on our taxes that we've cut \$74 off the price.

**\$49** PC/TaxCut (Yearly updates available for \$75) (PC, XT, & AT)

## Our copywriter swears by this.

That's right. Before our copywriter started using WordPerfect he couldn't block delete himself out of a brown paper bag of purple prose. Now he not only writes better copy in half the time, but he's stopped asking for raises because he's having such a good time. WordPerfect is a powerful, no-nonsense word processing package that stays out of your way while you're creating, and spares you many of the pains of editing. Now you too can work through lunch, and not even notice!

**\$219** WordPerfect 4.0 (PC, XT & AT)



## Buy this Quadboard!

How's that for hard sell? We're really putting it on the line with this one. The new expanded Quadboard that is. Everything the SixPakPlus has, plus a game port, I/O mounting bracket, 384K installed and tested, and Quadmaster software for \$249! Did we say 384K installed? Yes. Did we say \$249? Yes! Buy this board. But hurry before we change our mind.

**\$249** Quadboard 384K with clock calendar, parallel, serial & game port, I/O bracket, and Quadmaster software (PC, XT)

## Have Mouse. Will Paint.



VisiCorp took Mouse Systems' 2-button optical mouse. Added PC Paint. Mixed in 3.00V pop-up menu software for popular programs like Lotus 1-2-3, WordStar, VisiCalc,

etc. (You can write your own pop-up menu software for other applications.) The results are almost too graphic to mention. The price too electric to ignore.

**\$89** VisiMouse (PC, XT, & AT)

## While supplies last!

Doesn't the phrase "while supplies last" make you want to hop the next mule train to Marlow! In this case, a simple phone call will do. We have a new shipment of **Financier II** that we're going to sell so cheap your toes will curl. This is the classic home accounting software that answers the question, "Where does all the money go?" You'll easily be able to keep detailed records, and do account reconciliation. There's even an automatic check-writing feature that updates the database instantly.

**\$59** Financier II (PC, XT & AT)

## Make a PC the apple of your eye.



Digital Research's GEM Software can turn your PC, XT, or AT into a realistic Mac-alike. GEM DESKTOP replaces the whole PC DOS command structure with a header menu,

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110M

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# PC CONNECTION®

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## R:BASE Hits 5000

The eagerly awaited upgrade to R:BASE 4000 has finally arrived, and judging from the performance of the beta-test version reviewed here, it's a winner.

I've worked with *R:BASE 4000* a fair amount, but I don't share the enthusiasm that many others have shown for it. I was prepared for more of the same when I began to review the long-awaited new version, *R:BASE 5000*.

I'm glad I took the time. I received a beta-test copy of the new package, and, although it has a few rough edges (Microrim assured me that they've been smoothed over by now), *R:BASE 5000* is a truly outstanding Category 4 package. The following is a "sneak preview" of a major product, and not an in-depth review.

*R:BASE 5000* may well set a new standard for making complex database procedures accessible to more users. Its basic structure and commands are similar to those of *R:BASE 4000*: You open a database, create tables within it, and then can link different tables in a variety of ways.

Microrim has added lots of goodies, and these additions really make the program sing. A feature called Applications Express helps you create or modify databases and tables and generate custom menus, all through a menu-driven guide. With the custom menus you can quickly automate procedures—thereby creating complete, sophisticated applications—without knowing how to use *R:BASE 5000*'s programming language. The menus even let you enter data for selection criteria while you're using the menus, giving you even more flexibility to set up automated systems.

Using the Express feature is a snap. I set up a database with two tables, one with three fields and one with nine, and was finished in about 2 minutes. In the tutorial, one exercise calls for the creation of two menus, one nested in the

other, with a total of five options between the two. It took only a few minutes to create them both, and then the Automatic Express took over and automatically wrote the programmed code. In less than 30 seconds, it produced:

```
$COMMAND
compl
SET MESSAGE OFF
OPEN COMPUO
SET ERROR MESSAGE OFF
SET VAR PICK1 INT
SET VAR LEVEL1 INT
SET VAR LEVEL1 TO 0
WHILE LEVEL1 EQ 0 THEN
    NEWPAGE
    CHOOSE PICK1 FROM
    cmm IF PICK1 EQ 0 THEN
    BREAK
    ENDIF
    IF PICK1 EQ 1 THEN
    SET VAR PICK2 INT
    SET VAR LEVEL2 INT
    SET VAR LEVEL2 TO 0
```

and so on, for 76 lines of code.

The Express is not the only fast operator in *R:BASE 5000*. A program called GATEWAY manages data import from other files; it handles most major formats from popular programs. I imported 500 records in fixed-length ASCII format. GATEWAY showed me the first record in the file and asked me to show where each field started and stopped. It then matched the fields with the field definitions in the target table (the fields were not in the same sequence) and asked permission to go ahead. Less than 2 minutes later, all 500 records were safely in *R:BASE 5000*, ready to work. Rarely have I encountered such painless file transfer.

*R:BASE 5000* is no slouch when it

comes to speed either. A two-level sort of the same 500-record file took less than 15 seconds. The commands were also executed quickly, including my requests for on-line help.

Perhaps the most important addition to the earlier version is *R:BASE 5000*'s procedural programming language. Using the program's text editor, you can create your own files (which Microrim has curiously decided to call macros) using traditional commands such as IF, THEN, ENDIF, WHILE, and ENDWHILE. You can also call up menu files created by Express, such as the one above, and modify them as you wish.

Another major change is the addition of a PACK command. *R:BASE 4000* couldn't recover space from deleted records or tables, and it required you to reconstruct the deleted database under a different name. The same procedure still exists in *R:BASE 5000*, but now you may choose instead to PACK the database, which recovers the space from all deleted records and tables without the need to rename the files. This command can be put in a procedure, thereby automating what was a difficult process in the earlier program.

*R:BASE 5000* has many more features worth noting, but a review of them will have to wait until the final release. These include big points like the procedure file compiler that is included and little points like the fact that you get line-by-line control of printer features during printouts. I must admit that, even though I'm still lukewarm about the earlier program, *R:BASE 5000* is an exciting product. If the final release measures up to the promise of the beta version, this may well be one of the top software hits of the year.—

Alfred Poor

(beta-test version)

Microrim, Inc.  
3380-146th Place S.E.  
Bellevue, WA 98007  
(206) 641-6619

**List price:** \$700

**Category:** 4

**User interface:**

Menu-driven? Yes  
Interactive commands? Yes  
Procedure files? Yes  
On-line help? Yes  
Use of IBM keyboard? Poor  
Menu Creation? Yes

**Records per file:** Limited by DOS file limit.

**Files simultaneously open:** 40

**Record types per database:** Limited by disk space

**Fields per record:** 400

**Report flexibility:**

Column headings? Yes  
Multiple lines per record? Yes  
Calculated fields? Yes, per record and summary possible  
Subtotals? Yes, 9 levels, with page eject

**Files per report?** 40

**Data import/export:** Import to DIF via GATEWAY utility, SYLK (Multiplan), ASCII fixed length, ASCII delimited, WKS, dBASE II .DBF, PFS:FILE, R:BASE 4000 and 5000, Export-ASCII fixed length, ASCII delimited, DIF, SYLK.

**Data entry screens:** Painted, programmed, and automatic.

**Data field types:** character, numeric, fixed decimal integer, dollar, date (with date math)

**Copy protection:** No

**Requires:** 256K RAM (512K recommended), two disk drives (hard disk recommended).

CIRCLE 678 ON READER SERVICE CARD

entered field. Pressing Enter repeatedly will eventually get you back to the top, but this can be a long way to go. You can use the arrow keys to leave the data entry fields and move to the field of your choice by moving the cursor a line or space at a time. I felt uneasy moving out of the data field, but *VersaForm* won't let you enter data outside of the fields.

The program has no standard file structure and no way to import data, although it does have four data export formats. Applied Software Technology claims that the soon-to-be-released Version 3.2 will have an ASCII file import facility and string-handling commands that will enable you to work with just about any text file format. The new version will permit custom menu capabilities as well.

*VersaForm XL* is not the easiest program to work with, but it is certainly a good value in the high-power group. If you're looking for an inexpensive way to do multifile database programming, this package deserves a good look.

## filePro 16

A few years ago, my computer consulting firm survived almost entirely by helping people with a program called *Profile Plus* that ran on Radio Shack Model III's. When I opened *filePro 16*, which is based on *Profile Plus*, I expected to find the familiar, easy-to-use menu-driven system with its limited sorting flexibility and speed. I was wrong.

True, *filePro 16* is easy to work with, and it has the same sort of menus as *Profile Plus*. But it goes far beyond its predecessor in a number of ways that shoot it up to Category 4. The most important feature is that you can easily create custom menus to automate almost any *filePro 16* procedure. You create a menu by filling in the blanks on a data entry screen. Not only can you call *filePro 16* modules, but you can run DOS programs.

*filePro 16* has programmable capabilities that permit you to look up, verify, and post data between files. Rather than using a separate text editor or stringing commands together in a file, you create procedures by filling in an entry screen similar

to the one used for menus. These procedures not only handle the processing of data, but can put custom prompts on the screen to alert the operator. For example, during the tutorial using a sample set of files, I tried to enter an order for 100 units of a certain part. The following message appeared at the bottom of the screen:

Quantity on Hand for  
01-2345 is 98  
Press ENTER to continue

The Small Computer Company  
230 West 41st St, Suite 1200  
New York, NY 10036  
(212) 398-9290

**List Price:** \$495

**Category:** 4

**User interface:**

Menu-driven? Yes  
Interactive commands? No  
Procedure files? Yes  
On-line help? Limited  
Use of IBM keyboard? Fair  
Menu Creation? Yes

**Records per file:** 16,000,000

**Files simultaneously open:** 10

**Record types per database:** 36

**Fields per record:** 999

**Report flexibility:**

Column headings? Yes  
Multiple lines per record? Yes  
Calculated fields? Yes, 200 per record, summary possible  
Subtotals? Yes, 4 levels, with page eject.

**Files per report?** 10

**Data import/export:** No import, 4 export formats

**Data entry screens:** Custom; painted with limited editing.

**Data field types:** Character, numeric, fixed decimal, dollar, date/time (limited date math possible) logical (yes/no field)

**Copy protection:** No

**Requires:** 192K RAM, two double-sided disk drives DOS 2.x.

CIRCLE 673 ON READER SERVICE CARD

## telasol

**CALL  
TOLL  
FREE 1-800 IBM ONLY**

- Order Line 1-800-426-6559
- Order Processing & Other Information 602-224-9345
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Saturday 9:00 - 1:00

Address: 2222 East Indian School Road  
Phoenix, Arizona 85016

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- Free Air applies ONLY to orders up to 10 lbs.
- Shipping and Handling Add \$6.00
- Personal and Company Checks Will Delay Shipping 2 weeks
- Call on Purchase Orders
- Prices & Availability Subject to Change Without Notice
- We Do Not Guarantee Machine Compatibility

**FREE\***  
Add a FREE SS SHIPMENT  
-You Pay The Ground  
Rate The Air Free

**Puroator  
courier**

Framework .....	Call
Gem Desktop .....	Call
Gem Draw .....	Call

[illegible]

Word Perfect (Ver. 4.0) ..	\$209
Supercalc 3 (Ver.2) .....	\$159
TK! Solver .....	\$235

Wordstar 2000 . . . . .	\$239
Wordstar 2000 Plus . . . . .	\$289
Accounting Partner . . . . .	\$209

When I continued and told it to go ahead with the order, *filePro 16* informed me that the quantity on hand was now negative.

*filePro 16* has a lot going for it besides its programming strengths. You can define an edit mask to verify the characteristics for a data field; if you then make an invalid entry, an error message appears and *filePro 16* places the cursor at the point where the validation check failed. This makes correcting the entry much easier. You can also "dress up" your screens with lines and boxes to make data entry easier.

Installation is easy, since it is all handled by a batch file. *filePro 16* creates subdirectories automatically and modifies your *CONFIG.SYS* file if necessary. You have four disks to copy, however, so it does take a few minutes. The program has a lot of code, and one complaint to which impatient people should pay heed is that it takes too much time for modules to load. The program also has the habit of scanning all drives, starting with the A: drive, when it is looking for a module—a nostalgic throwback to the days of *Profile Plus*.

The manual is fairly well written, but screen prints are produced with the same letter quality printer as the rest of the text and therefore don't stand out well. The manual is also designed to cover the multi-user UNIX version of *filePro 16*, and this leads to some conflicts between the screen prompts and what is written in the manual. But these minor shortcomings are surmountable. The manual's main drawback is the lack of tabbed dividers; it's hard to find your way through a 400-page reference without some help.

*filePro 16* is a powerful product that lets you take advantage of its finer features with minimal effort. It deserves to be included in the heavyweight class of database programs, yet it is accessible enough so that you can start small and learn more about its capabilities as your needs change. This is one database package that's difficult to outgrow. ■

*Alfred Poor is president of Soft Industries, an independent computer consulting firm in Southington, Connecticut. Research assistance on this article was provided by David Thrailkill.*

# DSC Introduces AT capabilities IBM isn't telling you about.

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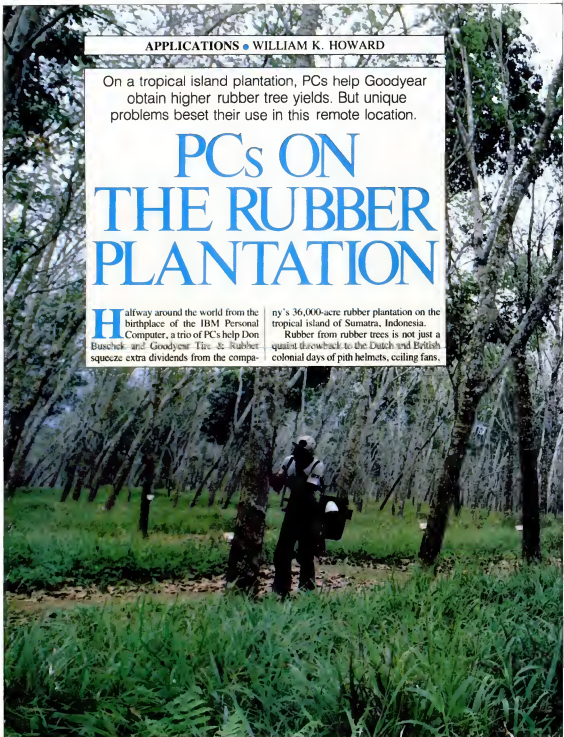
On a tropical island plantation, PCs help Goodyear obtain higher rubber tree yields. But unique problems beset their use in this remote location.

# PCs ON THE RUBBER PLANTATION

**H**alfway around the world from the birthplace of the IBM Personal Computer, a trio of PCs help Don Buschek and Goodyear Tire & Rubber squeeze extra dividends from the compa-

ny's 36,000-acre rubber plantation on the tropical island of Sumatra, Indonesia.

Rubber from rubber trees is not just a quaint throwback to the Dutch and British colonial days of pith helmets, ceiling fans,





and gin and tonics. About 30 percent of the rubber used in the United States is natural rubber. Because it withstands heat and flexing better than petroleum-based synthetics, natural rubber is prized for use in aircraft tires, surgical tubing, waistbands in underwear, condoms, and baby-bottle nipples. Most passenger car tires are blends of natural and synthetic rubber, and radial tires use a great deal of natural rubber in their sidewalls. Much of the world's natural rubber comes from Southeast Asia, particularly Malaysia, Indonesia, and Thailand, which rank first, second, and third, respectively, in world rubber production.

In Sumatra since 1917, Goodyear has accumulated voluminous records of the yields from Dolok Merangir (Doe-lock Merangue-gay), an estate covered with neatly manicured lawns, exotic shrubs, and graceful palms, in addition to the company's 4 million rubber trees. Goodyear's goal is straightforward: Find a way to make sense of all the information and exploit it for higher yields.

#### Enter the PC

Buschek, the plantation's finance director, oversees a project to develop a *dBASE III* database that will eventually store all known information about the trees and their yields, sort and report the information for in-house use, and send regular updates to Goodyear's corporate headquarters in Akron, Ohio. "Our goal is to use the database to isolate the factors that are most significant in establishing high yields or high resistance to disease," says Buschek.

Rubber tree records are arranged on a block-by-block basis, with each block measuring 500 x 500 meters, consisting of 25 hectares (a hectare is 2.471 acres). Each acre is planted with 500 tall and spindly *Hevea Brasiliensis* trees, which look nothing like the broad-leaved rubber trees that grace many American living rooms. The data available for each block includes the number of trees planted; the number of healthy, producing trees (usually about three of five); the incidence of leaf blight, root disease, or other diseases; the yield of rubber latex per block; the frequency of tapping (usually every third day); the type and amount of fertilizer applied; the stim-

ulant applied to the tapper's cut; the age of the tree (each block is planted the same year or within 3 or 4 years of each other); clonal type (tree breed); soil acidity; and geographic conditions. Generally, conditions are constant within each block.

#### Comparing the Yields

Once the database is perfected, the plantation's production manager, Jock Young, might be able to see, for instance, that one clone does especially well when

A *dBASE III* database will eventually store all known data on the trees and their yields, sort and report the data for in-house use, and send regular updates to Goodyear headquarters.

planted on hilly areas. He would have clearer evidence about the point where yields begin to fall off as a block of trees reaches old age (about 25 years) and would more accurately know when to order "slaughter tapping," an aggressive tapping process that maximizes the falling yield while hastening the tree's decline (the tree ends up as firewood, and the area is then replanted). Or, he might see that while a particular block appears to have the same type of trees, soil, and fertilizer conditions as similar blocks elsewhere on the plantation's 58 square miles, it yields significantly less latex. If the block is near a housing area or a road, the cause may be an act of human nature (pilferage) rather than mother nature, and he might order extra night watches.

In addition, the three 256K floppy-drive PCs speed the month-to-date and year-to-date production reports that used to be done by hand and have now been switched to *MultiPlan* and *1-2-3* while the *dBASE III* project is in development. And because the reports can be shipped on disk as well as in a printout, Goodyear executives in Akron can manipulate them further if they desire. They currently receive a 50-page printout each month.

*MultiPlan*, the first software program used by Goodyear in Sumatra, lacks the sorting capabilities needed to analyze all the possible relationships between yield, disease resistance, and other factors. Production manager Young, who has one of the three PCs, now uses *1-2-3* for most of his monthly and year-to-date work.

The *dBASE III* program to store and analyze tree yields is written in both English and Indonesian. When perfected, it will be fully menu-driven so that inexperienced users can be guided by on-screen instructions and a list of options, rather than forced to face the silent and mysterious *dBASE* single-dot prompt. Staffers, who now do manual recordkeeping, will enter data on yields and field conditions themselves, so a separate data-entry staff won't be needed.

#### A Payroll Program

The programmers are also writing a payroll program for the plantation's 8,000 employees because no packaged payroll or general ledger program can cope with the complexity of local conditions, especially the 11-digit integer requirement that converts Goodyear's Sumatra assets into local currency, the rupiah, equal to about 1/10 of a cent.

Buschek estimates that each week's payroll requires 400 bytes per employee times a staff of 8,000, or 3 to 4 megabytes per pay period, plus another 3 to 4 megabytes to keep year-to-date summaries. In addition to earnings in rupiah, Goodyear offers a complicated incentive system for the tappers, as well as commodities, such as rice (15 kilograms a month, minimum) to every employee. All of this information must be on the pay voucher, which is only a stub. The payroll itself is cash. "There'd be a riot if we paid by check," Buschek jokes. (At one time, Goodyear paid out more than a dozen commodities, such as dried fish, palm oil, and firewood, but that's been whittled down.) In addition, the company provides housing, medical care, schools, and churches for all of its workers.

The payroll is now being processed by hand, which is a slow and costly process. Buschek wants to see if the payroll package can be put on a PC. He has tried two payroll packages, IBM's *Peacree* and an

IUS accounting package, but neither could handle the complexity of Indonesian pay vouchers or be patched for local conditions. With a computerized payroll, Buschek estimates that he could reassign as many as 20 employees to other, more-productive tasks. Layoffs and firings are unheard of in Indonesia.

#### No Phones

Buschek and his staff also work under other conditions that might be considered primitive by stateside standards. One diesel generator supplies power to all the machinery, offices, and homes at the plantation. Occasional dropoffs to half the needed voltage are regular features of plantation life, requiring sturdy voltage regulators to assist every PC.

Then there's the PC maintenance problem. Unfortunately, there's no ComputerLand of Sumatra to call. As a matter of fact, no IBM repair service is available on the island of Sumatra at all, even though Indonesia happens to be the world's fifth most populous country. Until recently, it wouldn't have done any good to have a repair shop to call anyway, because the plantation didn't have a phone until several months after the first PCs arrived in February 1984. It shared a telex machine with a bank in the nearest town, a half-hour away.

For PC repairs, Buschek or another staffer tosses the ailing machine in the back of the plantation's Peugeot for a wild 2-hour, 113-kilometer, ride to the airport at Medan. The roads are reasonable, but the other drivers are wild, and it's easy to see why Indonesia is among the world leaders in auto fatalities. Then it's a 2-hour flight to the island of Java and Indonesia's capital, Jakarta, where IBM Americas/Far East Systems Corp. offers 24-hour repair service. This is no problem because there's no same-day plane service back to Sumatra anyway. This junket makes the \$500 a year on-site service contract common in the United States seem like small change.

#### The Local PC Guru

To avoid the time-consuming trip, Buschek handles what he can locally. However, he's really a money man who's a computer nut on the side. He first became

interested in electronics during a hitch in the Navy as a radioman. He acquired an accounting degree at Penn State and has been at Goodyear for 17 years, including 8 years as an internal auditor for Goodyear's overseas operations and 2 years as an assistant financial director specializing in international compensation for expatriate workers.

Because he dealt with big computers in Akron, Buschek took and completed a 20-credit certificate program in mainframe

**Programmers are writing a payroll program for the plantation's 8,000 employees because no packaged payroll or general ledger program can cope with local conditions.**

and minicomputer programming at Akron University. "In the last year of the course (February 1983)," Buschek recalls, "I bought an IBM PC, and all of a sudden I was no longer interested in the courses."

When Goodyear offered Buschek the finance director's position in Sumatra, the company told him there already were three PCs on the plantation, and he offered to help coordinate the pilot programs for the rubber-yield analysis and the payroll. Buschek also decided to advance his pet theory: Given a choice between microcomputers on users' desks and a data processing department with a minicomputer in an air-conditioned room, the PC is almost always the way to go.

Goodyear's tire factory in Bogor, Indonesia, near Jakarta, has an IBM System 34 minicomputer that is giving way to a newer System 36. The company has offered it to the rubber plantation, but Buschek says he wants to see if the PCs, upgraded with hard disks and possibly led by an AT, can handle the payroll on their own.

"I want to avoid what has happened in other large companies that have established centralized data processing departments that are unresponsive to users' needs," says Buschek. "They're sadled

with input-output controls and required to make all kinds of reports to headquarters on their progress."

To establish a data processing department might also upset the social order. Indonesia won't generally allow foreign programmers or systems managers in the country (of 8,000 plantation staff and workers, just five are foreigners), and the salary increment needed to entice an Indonesian programmer to move from populous Java to isolated Sumatra would skew the salary structure. Buschek also says Goodyear wants to promote from within to be fair to employees. He makes a strong case for micros over minis.

#### Finding a Backup

Looking ahead, Buschek wants to add hard disks and more memory to the plantation's PCs, but he's concerned about limited product availability in Indonesia and whether everything has to be purchased from IBM to ensure IBM service in Jakarta. If it can be done, he wants to string together a simple network to share the hard disks and printers. Buschek also wants a word processing program because he likes to agonize over the exact nuances in memos and letters.

In the near future, Buschek would like to obtain a fourth PC as a backup when one of the other three is down for service, and a faster printer than the 80 cps IBM Graphics Printers now used to churn out reports and payroll vouchers. "Of course, we're doing everything on a shoestring here," Buschek says. "If it takes 10 hours to print the payroll, well, that may be acceptable."

And, of course, Buschek still has his own 2-year-old PC for playing around with at home.

Keeping things in perspective, Buschek smiles and says, "I'm the local computer expert and what do I have? Twenty credits for the System 370! If something doesn't go exactly as we'd projected, people are going to say, 'Hey, this guy's supposed to be an expert, and he doesn't know what he's talking about.'"

So far, the odds are good that Buschek does know what he's talking about. ■

*William K. Howard is a frequent contributor to PC.*



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## KEY TRONIC

is not cheap, but, for some applications, price may be a moot point.

The Key Tronic keyboard is plug compatible with the IBM PC, XT, and compatibles that use the standard 5-pin DIN plug keyboard interface. The unit itself is almost identical in appearance to Key Tronic's KB5151 Professional Keyboard. Both have separate cursor movement and number pads, a Pause key, which duplicates the PC keyboard's Ctrl-NumLock combination, and large return and shift keys. Both have short-throw key action and non-clicking, sculptured keys.

What sets the KB5152V apart from the KB5151 is its speech recognition capabilities. It comes with a high-quality headband-mounted microphone, speech-recognition software (written in BASICA), and an extra printed circuit board hidden away inside the keyboard (containing a Motorola 6803 microprocessor, some ROM, 16K of static RAM, and some support circuitry). In addition, the system has two minijacks at the rear: one for the microphone and one for a foot switch that toggles the voice circuitry on and off.

### Training Your Keyboard

Getting a computer to recognize someone's voice is no easy task, primarily because of the myriad variations in the sound of human speech. One person's voice changes pitch and timbre from hour to hour or day to day. Consequently, it takes a lot of technical power to teach a machine to reliably recognize even the simplest human utterance. The initial phase of setting up the KB5152V involves "training" the keyboard. You use the supplied program and editor to type in a written word list that consists of the words or sounds you want the keyboard to recognize via the microphone. Each word is followed by the command(s) that you want sent to the computer

after it recognizes the word. For example, once you correctly train the keyboard, you can say the single word *backup* to send the PC a series of commands as complex as

```
CD\MAIN <RETURN>
COPY *.NEW.D: /V <RETURN>
```

These commands resemble a batch file in DOS or macros in a keyboard-utility program, such as *SmartKey* or *ProKey*. The only difference is that you trigger the macros with your voice rather than with key presses. Once you create a word list, you speak each word into the microphone several times in response to on-screen prompts, until the program is confident that each word was clearly heard and recorded. Every 5 milliseconds, the program

The microprocessor  
transmits the command  
through the keyboard  
cable to the computer  
just as if you had  
typed it in.

takes a digital sample of the sounds you make as you say the word, recording all frequencies between 250 and 7500 Hz.

A noise-compression algorithm program subdivides and processes each sample into 16 separate bandwidths and then converts the voiceprint into a 128-bit package. Each time you repeat the word, the program repeats this process several times, refining the voiceprint with each pass. Then the program assigns the resulting digital voiceprint to the word and stores it on disk, thus ending the training process. Since voices vary greatly from one another in pronunciation, harmonic overtones, and modulation, all speakers must individually train the processor. Once you've trained the processor, another command saves your set of newly created voiceprints to disk, available for future use.

Unfortunately, because of problems in the DOS BIOS, Key Tronics has resorted to the use of a slow data transfer rate during this process to avoid the loss of data. A typical vocabulary takes a little less than 5 minutes to upload. Reversing this process later, by downloading a vocabulary into

the keyboard's internal RAM from disk, is a bit speedier. But you can download only when you power up your PC or a new operator takes the helm.

Once you load a new vocabulary, the system waits for either your voice or keyboard data entry. From this point on, whenever you utter a sound, the voice circuitry switches on, begins recording the sound digitally, and waits for the utterance to terminate. This new voiceprint is stored in the keyboard's RAM along with the voiceprints of the current vocabulary. Now, the keyboard's internal microprocessor begins the task of trying to recognize every word you speak; it mathematically compares the new digitized voiceprint to all the others in the list.

The result of each comparison is, of course, a numerical value, and the comparison that scores the highest is most likely to be the word you wanted the keyboard to recognize. If this one score is high enough, the keyboard considers this a mathematical match, meaning that recognition has occurred. All the keyboard knows is that the two utterances are enough alike to qualify as identical.

Once recognition occurs, the rest is relatively simple. The microprocessor serially transmits the command that you paired with the key word through the keyboard cable to the computer just as if you had typed it in.

On the other hand, it's possible that the sound you spoke didn't cut the mustard at all—that is, it did not score high enough to qualify as any of the words in the current vocabulary. In this case, no commands are sent to the computer.

### Real-World Testing

How well does this speech recognition device work? As a real-life test, I used the microphone to execute all the repetitive tasks I do with my computer, such as changing directories, loading *dBASE II* programs, calling MCI Mail, and moving the cursor around in *WordStar* (see Figures 1a and 1b for my initial word list).

The program accepts nonprinting characters, including backspace, Ctrl, return, tab, and F1 through F10. Other nonprinting keys and key combinations, such as Alt and Ctrl-Break, can be handled but require the use of keyboard scan codes. I use



### KB5152V Speech Recognition Keyboard

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## KEY TRONIC

the HI and BYE commands to enter and leave CompuServe's CB simulator. I included them in the word list to test the speech system's ability to discriminate between words that sound similar.

It took 30 minutes to enter, train, save, and load the vocabulary in Figures 1a and 1b; just saving the words took about 3 1/2 minutes. The system creates two files per

vocabulary. The first is simply the text file containing the words on the list and their corresponding macros; for my test vocabulary, this file was 301 bytes long. The second, the image file, contains the voiceprints and other system parameters, my image file came to a whopping 25,798 bytes. According to Key Tronic, however, the maximum file size—even for a 160-

word vocabulary—will be less than 32K, with each additional voiceprint consuming only 134 bytes.

### Difference Value

After training the keyboard, the manual suggests that you test your words for separability and recognition, with the programs that are supplied with the keyboard. Two menu-driven procedures then give you an idea of the success or failure rate you can expect to achieve with your vocabulary. The separability test compares all words in the vocabulary and reports all comparisons that have a "difference value" below a stipulated level (see Figure 2 for the results of the separability test with a minimum level of 20, the recommended value). Based on these numbers, I expected the words *page up* to cause a PAGE DOWN command, but, to my surprise, the HI and BYE commands were the only ones that were mixed up on a regular basis.

The recognition test is based on a factor called the "reject threshold," which is just one of 14 parameters governing the finer points of recognition during operation. Because no two utterances of the same word will be exactly alike, you must allow for some "slip range" when searching for a match; the low end of this range is the reject threshold. If a word, after being compared to all words in the vocabulary, scores below the threshold, the program rejects it. In normal operation, a rejected word is simply unrecognized and nothing is sent to the computer. During the recognition test, however, the program reports when a word scores below threshold. So, with the aid of the supplied tests, you can determine the weak points of your vocabulary and make appropriate changes.

### Word Confusion

To get around the device's confusion with the words *hi* and *bye*, I took the manual's advice and substituted *hello* in place of *hi*. Word confusion is not an uncommon problem with voice recognition, and the chance of voiceprint "collisions" increases in proportion to the size of the vocabulary in use. Luckily, you can also use node switching to avoid misinterpretations. With node switching, you can subdivide a vocabulary into as many as nine sections, each having its own node word.

```
MAIN; Wordstar; cd \ws{R}WS{R}
DBASE; CD \DBII{R}DBASE M{R}
MCI; CD \XTALK{R}XTALK MCI{R}
COMPUERVE; CD \XTALK{R}XTALK CIS{R}
HI; Hi Everyone!{R}
BYE; Bye Everybody. Got to go. See you later!{R}
UP; {C E}
DOWN; {C X}
LEFT; {C S}
RIGHT; {C D}
PAGE UP; {C R}
PAGE DOWN; {C C}
SAVE; {C K}S
```

Figure 1a: A printout of the actual text file created for the sample vocabulary.

Word	Command
WordStar	cd \ws <return> ws <return>
DBASE	cd \dbii <return> dbase m <return>
MCI	cd \xtalk <return> xtalk mci <return>
CompuServe	cd \xtalk <return> xtalk CIS
Hi	Hi Everyone!
Bye	Bye Everybody. Got to go. See you later!
Up	^E
Down	^X
Left	^S
Right	^D
Page up	^R Page
Down	^C
Save	^KS

Figure 1b: A sample word list and corresponding commands.

Word	Difference Value	Closest Word
HI	16	BYE
PAGE UP	19	PAGE DOWN
PAGE DOWN	19	PAGE UP
SAVE	18	DBASE

Figure 2: Results of the sample vocabulary's separability test.

Lotus, dBase, WordStar and MultiMate Users

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Only one node can be active at a given time, dramatically eliminating the possibility of confusion with words in other nodes. You activate a node by simply saying the node word.

#### Advanced Programming

To handle specific needs, you can alter one or more of the 14 technical variables of the recognition process. Here's a closer look at three of these variables:

**Gain.** This variable determines the sensitivity of the microphone, compensating for unusually quiet or loud voices and noisy environments where ambient sounds could trigger the voice unit. Incidentally, the unit seems to be very tolerant of volume changes. You can speak quietly or yell the same word without any problems.

**Delta threshold.** This value helps to prevent incorrect word substitution if two words have very similar voiceprints. For example, sometimes when I said *hi*, nothing happened, not because the word was not recognized, but because two voiceprints matched my word closely enough to qualify as matches.

**Noise threshold.** This refers to the detectable difference between the voice input and the average background noise. This helps prevent accidental triggering of the speech processor by outside noises.

Many more parameters of the processor are programmable, and a 12-page appendix for programmers lists all the necessary codes using the message protocol for the IBM PC keyboard interface. You can use this information to write your own utility programs or obtain the source code from the company to use as an example.

#### Also Noteworthy

A few other features of the system are worth noting. These options may just make the difference in certain applications. The most important of these is the ability to set a higher rejection threshold for individual words in a vocabulary. Words that must be input accurately—for example, a patient's blood pressure reading—can be assigned a high rejection level, while less-critical words can be given more slack. Another useful feature is a standby mode through which the voice circuitry may be toggled on and off via a vocal command. This is useful when answering the phone or talking to someone when you can't reach the on/off pedal or keyboard button. Finally, you can duplicate the automatic repeat capability of the IBM keyboard by assigning a word of your choice to the repeat function. When you say this word, the program repeats the last recognized command at a rate of four times per second until the microphone perceives another utterance.

The manual comes in a standard three-

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## KEY TRONIC

ring IBM-sized binder. It is not typeset, but the printing is letter quality and illustrations are included. Also included are troubleshooting and recognition improvement sections and a 108-entry index. It is, for the most part, a well-written, informative document. A toll-free technical assistance number is listed with the table of contents.

### Who Needs It?

Admittedly, the Key Tronic Voice Recognition keyboard is not a high-demand product, and its price tag doesn't help. According to Key Tronic, the KB5152V is targeted at those for whom keyboard data entry is simply not possible. This includes some disabled users, even those who cannot speak clearly. As long as a handicapped person can repeat his or her utterances, the device will work. The same is true for people who cannot speak or type English. Other possible uses are in industry settings where the operator's hands are

not free for typing—at quality-control inspection stations, brokerage houses, or in parcel-handling jobs, for example. And, of course, if you hate to type and have

**The Key Tronic KB5152V is an acceptable, though expensive, alternative to keyboard-only data entry.**

\$1,500 to spend, this product may just be your cup of tea.

If you are comparison shopping, you will find the Key Tronic to be one of the better values in voice recognition equipment. Other available products include systems from Interstate (suppliers of the chip set that the Key Tronic uses), which consists of a plug-in PC compatible board sans software; a Texas Instruments system which runs only on its machines; and Vo-

tan for the PC. All of these products are more expensive than the KB5152V. However, at the West Coast Computer Faire, Logical Business Systems of Sunnyvale, California, recently introduced a 32,000-word system for under \$1,000.

The Key Tronic KB5152V is an acceptable, though expensive, alternative to keyboard-only data entry for the IBM PC and compatibles that use the standard keyboard interface. Not to be overlooked is the 5151-style keyboard (which lists at \$225) that's part of the package. Although the cost of speech recognition devices will probably drop somewhat, it's not clear just how much. It's probably not worth your while to wait—if you're in the market for a speech input device, you may want to consider the Key Tronic KB5152V.

*Robert Cowart is a free-lance writer and electronic-music specialist based in the Bay Area.*

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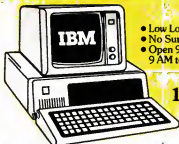
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# BACKING UP MADE EASY

InfoTools's *Bakup* and Gemini Backup from Gemini Software make backing up your disks less tedious. Both offer a ready-made system and provide all the insurance you need against a hard disk crash.

**H**ard Disk backup is a particularly thankless task, a tedious chore that accomplishes nothing but filling a number of floppy disks with genuinely redundant data and wasting your time. Yet, whenever you put a lot of valuable data on the line, you can't get around backing up because it's the only protection you have against crashing hard disks and accidental file erasures. But you would be a fool, indeed, to pass up any opportunity that makes backing up less of a chore.

Until recently, the primary backup alternative to floppy disks has been the dedicated hardware system—streaming tape, cartridge disks, and so forth. Although such systems are workable, the hardware itself is expensive. Moreover, specialized backup hardware is contrary to the underlying philosophy of the computer—computer hardware is supposed to be universal and able to handle any job, but dedicated backup hardware fills only one limited application.

Both *Bakup* by InfoTools and Gemini Software's *Gemini Backup* can ease your backup irritations because they use nothing more than the floppy disk drive already installed in your PC. Even better, they really cut through the backup bother when used in conjunction with hardware of greater speed and capacity than the humble floppy disk drive.

Although both programs make the same promise—to help you make better, more reliable backups—the underlying philosophy of each of them is different. Like a drill sergeant, *Bakup* forces order upon the chaos of making backups. Its complete system ensures that you make proper backups and are

fully prepared when the worst does happen. Moreover, to make your new backup routine endurable, it works faster than the standard DOS BACKUP utility and cuts the time you have to spend in each backup session.

The *Gemini Backup* system goes one step further—it works automatically. As soon as you turn your machine on, it goes hunting for backups to make. And if you don't remember to back up your important files, it will. Magically, it takes care of its mundane chores almost unobserved, while you're whiling away the hours on more-important matters, such as using *1-2-3* or playing *Frogger*.

## Taming the Backup Process

Their methods may be different, but these two programs are similar in many ways. Both aim to tame the backup process and are perfectly content to substitute for DOS's own backup procedure, pulling files from hard disk and putting them on floppy. Like DOS's BACKUP, these two programs let you back up one or all the files that you've carefully packed onto your hard disk. After you've made your one grand, overall backup, you can rely on both programs to automatically back up only the files that you've modified since.

Both *Bakup* and *Gemini* can make better use of your floppy disks than does DOS. They allow you to add more than one backup session to a single disk. If your backup floppy disk is half full, you can add more files to it, rather than always needing more disks. (DOS's wasteful attitude might make you think that IBM is out to sell floppy disks.)

Not only do they use fewer backup disks, both programs let you do more with the backups you

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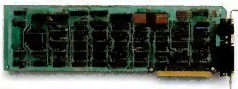
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## BACKING UP

make than merely restoring your data. They store your data in standard DOS files that can be individually copied with the standard COPY command. You can even directly execute the backed-up copies of your programs from the backup disks.

### A Faster System

**Bakup** is the program that IBM should have given you with DOS. It's faster, easier to use, and more versatile than the official utility. If you think about the speed limits imposed on floppy-disk backups, you may wonder how much faster **Bakup** can be. The speed at which floppy disk drives absorb information is pretty much out of the reach of performance-boosting software. Nevertheless, when I compared **Bakup**'s speed with that of DOS's BACKUP utility in grinding about 2 megabytes of files from hard disk to floppy, I found the former 20 percent faster overall.

Part of the speed difference can be attributed to differences in how the two programs work. As the DOS BACKUP program runs, it adds a bit of extra information to each backed-up file so that the RESTORE program knows what you've done and how to deal with it. To add that information, the program requires some additional microprocessor time. **Bakup** doesn't process along the way; it digests the contents of your disk before it

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starts and builds up its own separate index or catalog that records what came from where and what went where. Then it merely copies the files to be backed up without any further ado.

## A Simplified System

*Backup* is easier to use than the DOS BACKUP utility because it is a menu-driven rather than command-driven program. You type in the command BAKUP, and

the program gives you an on-screen selection of backup and restoration options. If you lose your way or become confused, on-line help is only a keystroke away.

InfoTools gives you instructions and a complete system that's already set up—unlike IBM, which gives you a single BACKUP command and a few pages of information about the program and what it does. Not only does *Backup*'s thin pamphlet-style instruction manual give you specific guidance on creating a complete backup system, but InfoTools also includes 50 disk labels, all sequentially numbered and ready for your use when you implement such a system.

At its heart, the *Backup* system is not so different from the one you can set up with DOS. You make an initial overall backup of your hard disk, and then each day, you make an incremental backup of the files that you've changed since the full backup. *Backup* does differ, however, in the additional support it gives you. It advises you how many floppy disks you'll need before you start. It even tells you which numbered floppy disk to use. With its catalogs, *Backup* keeps track of which file is on which disk and how much free capacity is available on each one, allowing you to cut media costs by adding files to partially used backup disks.

## More Versatile Than DOS

Because it does not restrict you to floppy disks, *Backup* is more versatile than DOS's BACKUP utility. *Backup* can send your backup files to any device that has a drive letter. InfoTools officially acknowledges that you can use the *Backup* program with double-density floppies, high-capacity (AT-style) floppies, super-high-capacity (Kodak 2.8-megabyte) embedded-servo floppies, Syquest Winchester cartridges, IOMEGA Bernoulli cartridges, and Interdyne file-oriented tapes.

*Backup* is more versatile, too, because it stores your backups as normal DOS files—with no added information, no extra strange characters, no funny names—so that you can quickly copy them when you need to do a fast restoration of a single file that you've accidentally erased or want to transfer files to another machine.

Unfortunately, *Backup* puts these normal files in subdirectories with catchy

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names like BKP00010.005. Without using *Bakup* to read its catalog, you won't know which of your files is stored in each subdirectory. Once you dip down into those subdirectories, however, you'll find your backups in standard DOS files with names identical to the originals.

I experimented with these files and found both some good news and something ominous. The copy of the BASIC language that I had backed up onto floppy ran fine, and backed-up text files looked identical to the originals. But when I tried to run the *Bakup* backed-up copy of Logo, my PC crashed. I made a random check of

Because it does not restrict you to floppy disks, *Bakup* is more versatile than DOS's BACKUP utility. It can send your backup files to any device that has a drive letter.

some of the nearly 100 files that were involved in the same backup session, and the copies appeared identical to their originals. I suspect that either a random error appeared on the floppy disk I used for the backup or some little bug in the program had gnawed its way through Logo.

#### Liveable Copy Protection

Either despite or because of its copy-protection scheme, *Bakup* is easy to install. You type INSTALL and the whole process of copying a disk full of files is automatically handled, including the creation of an InfoTools subdirectory filled with *Bakup* and all of its support files.

Although I view copy protection, in general, as a personal affront and a tiresome bother, the scheme used by InfoTools is the least obnoxious one I've encountered. Not only can you install *Bakup* on your hard disk, the program is written with that mode of operation in mind. Although you might encounter a bug somewhere in the *Bakup* program code, you are guaranteed that there are no worms in the copy protection. After all, backup soft-

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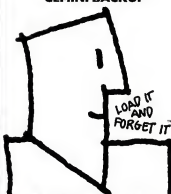
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## BACKING UP

ware is supposed to let you rest easy, not bring its own nightmares along for the ride.

The copy-protection scheme limits you to making three installations of the pro-

gram. You can de-install *Bakup* to recover each of those installations, however, if you want to move the program from one machine to another.

InfoTools warns that you should con-

serve at least one of your installations in case your hard disk goes down in flames. You have to have *Bakup* installed to properly handle a complete disk recovery. If you count badly or make a mistake and run out of installations, however, InfoTools grants you an out: the program manual claims the factory can give you (as a licensed user, of course) an extra installation over the telephone.

### The Ultimate Backup Solution

Not long ago I came up with what I consider the ultimate backup solution: a second, duplicate hard disk (see PC News "Down Time" column, *PC*, Volume 4 Number 10). The only obstacle I found to effective use of this solution was a lack of software. *Gemini Backup* is the software I needed because it can siphon files from one hard disk to another without any intervention at all. Unfortunately, few people have twin hard disks, and good as *Gemini* sounds, it has some weaknesses when used with floppy disks. In theory, you just turn on your PC, and the program silently takes over and goes about its business, finding unprotected files and clandestinely copying them to backup floppies. While going about this business, *Gemini Backup* is one genuinely sneaky program. It lays back quietly until it thinks you're not watching, then it takes over—leaping into foreground operation to make high-speed backups. As soon as you assert yourself and start back to work, *Gemini* slinks back into the background, waiting again for its chance.

In practice, however, if you use floppy disks for your backups, you'll soon find one flaw in this procedure. Eventually, you will run out of backup disk space, and you will discover that the program can't put in the next disk it needs by itself. Moreover, you end up sharing or completely giving over one of your floppy disk drives (or other hardware) to the program. Although you can still use the backup floppy disk drive for routine chores, you'll always know that *Gemini* is there. Even the sound of using the floppy drive changes—you get about double the grinding noise of unadorned DOS—and most disk operations seem to take much longer.

To play it safe, you should suspend the operation of *Gemini* before using the



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shared disk drive. If you don't, the program may automatically take control and copy a backup file to the wrong disk.

#### Time Sharing

When *Gemini* lurks in the background and is not copying to your backup disk, it shaves such a tiny bit of thinking time from your PC's microprocessor that it doesn't appreciably slow down the progress of whatever applications program that you run. It does not interfere with normal program operation. In fact, if the application you run in the foreground ties up your PC's microprocessor, *Gemini* will be effectively locked out of operation. I found that an endless loop in BASIC that accomplished nothing, such as 10 GOTO 10, effectively prevents the program from doing its backup work.

In everyday operation, the most noticeable hint that *Gemini* is living in your PC is a bright and bold message that warns how many files must be backed up (if any) and appears in the lower right corner of your screen almost whenever the DOS prompt is visible. When *Gemini* needs you to switch floppies, the bottom three or four lines of your screen will be consumed with a highlighted warning. These messages are probably the most obnoxious part of the program. If you install the program because you don't want to be bothered with

**Gemini Backup is one sneaky program. It lays back quietly until it thinks you're not watching, then it takes over—leaping into foreground operation to make high-speed backups.**

backups, you'll probably end up bothered by the brightly glowing message.

In 40-column mode, the messages prove even more obnoxious, taking up a greater share of the screen and even wiping out the DOS prompt should it dip into warning territory. Although the documentation doesn't offer you any means of turning all the messages off, the loathsome leg-

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## BACKING UP

ends automatically go away when you run applications programs.

*Gemini* simplifies installation as well as backing up. You just type GEMCOPY and GEMCOPY2 to copy the two distribution

floppies to hard disk, and then you call up the menu-driven installation program, which is appropriately called *Gemini*, which leads you through the rest of the procedure. It appends commands (and some

remarks) to your AUTOEXEC.BAT that make your PC automatically load and start *Gemini* whenever you turn on your PC.

Before you finish the installation and start normal operation of *Gemini*, you'll probably want to make a full disk backup. The process requires only that you have a stack of completely blank, formatted floppy disks on hand and make the appropriate selection from the program's menu.

If you follow a few simple rules, and yield one floppy disk drive to the program's needs, you need not learn anything more about *Gemini*. However, a large number of extra features are packed into its code, including the ability to let you customize its installation for any kind of PC system, mold its operation to suit your needs and hardware, and temporarily or permanently suspend the program's operation so that your PC will behave more like a normal computer.

The installation menus for customization are somewhat confusing, but probably no more so than those of most such programs. My only complaint was that when I selected to operate the system with a composite monochrome monitor, I observed no improvement in on-screen quality. The program still acted as if I had a color display, and some text was illegible.

To handle utility functions, such as making additional full-disk backups, formatting floppy disks to make them suitable for backing up, stopping or restarting the automatic backup function, or changing the default setup of the system, you have your choice of running the menu-driven *Gemini* program or using the system in command-driven mode. For instance, GEMCMD SUSPEND command suspends normal backup operation.

### Slower Than DOS

Overall, a total backup using *Gemini* is slower than the standard DOS backup utility. Using about 2 megabytes of test files, I measured *Gemini* to be 18 to 20 percent slower. Worse, unlike *Bakup* or DOS, *Gemini* does nothing to reassure you that everything is going well while it makes a whole disk backup. You continuously see the same old screen with no indication of which—if any—file is being backed up.

The extra time that *Gemini* spends making the total backup has its benefits, how-

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ever. Instead of making unusable files, like DOS does, or burying the files in strange subdirectories, like *Bakup* does, *Gemini* makes copies that are identical to the originals and creates exactly the same directory structure and path as those of the original file. For instance, if you have a file buried in several subdirectories so that the path to find it is \ROOT\SUBONE\SUBTWO\FILE, the backup will be in exactly the same subdirectory with the same

Unlike DOS or *Bakup*, *Gemini* makes copies that are identical to the originals and creates exactly the same directory structure and path as those of the original file.

path structure on the backup floppy disk. You can directly run the programs you've backed up—all that I tried worked without a hitch—and you can read your data or text files. For safety's sake, however, *Gemini* marks your backups as read only, so that you cannot change or erase them.

When the worst happens, you'll find that *Gemini* hardly alters the restoration procedure that you would need to use with DOS. You must run through all the incremental backup disks you've made since the last total backup (and in proper order) to restore your hard disk completely to its state before the failure. Of course, recovering an individual file or directory is much easier because you only need to copy what you want directly from your *Gemini* backup disks using *Gemini* or the ordinary DOS COPY function.

The silver lining to this dismal restoration cloud is that with *Gemini* you probably won't lose much more than one file. Other systems, even when used at the recommended daily intervals, can leave up to a day's work unprotected. *Gemini* keeps your backups nearly up to the minute.

The major difference between *Gemini* and *Bakup* is style. The choice of which one is best for you depends on whether you work best with an established regimen or

require something more complex and automatic. Both programs give you a ready-made backup system that you need never worry about. And if you follow their rules, both programs will give you all the

insurance you need against the dreaded crash of your hard disk.

Winn L. Rosch is a contributing editor for PC Magazine.

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# A Snapshot for Remembrance

Snapshot can save your data a screenful at a time, then call it back again—all without asking you to leave your work in progress.

**B**efore submitting her final report on the season's digging, noted Egyptologist, Dr. Rosetta Stone decided to run it through her new style-checking program. Not surprisingly, *PurpleProse: The Good Writing Arbiter* reported the following string of errors:

Error 0014 - Verb agreement

"We was excited with the map."

Error 0091 - Wrong case

"Me and Dr. Kent bought camels in Cairo."

Error 1000 - Slang

"In conclusion, there ain't no curse."

Knowing that next year's grant could hang on this year's report, Dr. Stone immediately reopened her file to correct these mistakes, but by the time she had fixed the first one she had already forgotten the other two. What she needed was Snapshot.

## What It Does

Snapshot is a program that lets you store an entire screen at the touch of one key and then pop it back at the touch of another. Had Rosetta stored her screenful of errors in this way, she could have consulted it at any time and as often as she chose—even while her editor was running.

In addition to storing one "live" screenful for later use, Snapshot also allows you immediately to display up to three "prefabricated" screens you have saved as individual files. Using this feature you can make up menus, help screens, ASCII tables, phone directories, lists of Pascal commands, appointment calendars, or the like and retrieve them with a keystroke, without being obliged to leave the work

## 1985/No. 14



that you already have in progress.

If you have a modem, you can download the Snapshot files from this article directly by calling PC's Interactive Reader Service at (212) 696-0360. Failing that, the easiest way to make your own copy is to type in the BASIC program listed in Figure 1 and run it, using DOS 2.0 or a later version. The BASIC program will ask you which key ("N", for example) you would like to use to store the screen and which key you'd like to use (e.g., "F") to flash that screen back on. The program then prompts you for three similar "trigger" keys that will be used to recall the prefabricated screens you have stored under the filenames A.DAT, B.DAT, and C.DAT. I use "A", "B", and "C" for these, though you may choose any keys you wish. You'll obviously want, for example, to avoid conflicts between the Snapshot keystrokes and



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# PROGRAMMING

```

10 DIM KEYS(10):SUM#=0:PRINT"Checking Data..."
20 FOR I=1 TO 606:READ BYTE.%.SUM#=SUM#+BYTE.%.NEXT I
30 IF SUM# <> 51461 THEN PRINT"Error in Data Statements":GOTO 320
40 RESTORE:FOR I=1 TO 10:KEY I,"":NEXT I:CLS
50 LOCATE 10,15:PRINT"      Type the key to store the screen with."
60 LOCATE 11,15:PRINT"      (Use Control End if none)."
```

70	GOSUB 330	
80	IF CODE1=0 AND CODE2=117 THEN GOTO 140	
90	KEYS(1) = CODE1:KEYS(2) = CODE2:CLS	
100	LOCATE 10,15:PRINT"      Type the key to flash what has been stored "	
110	LOCATE 11,15:PRINT"      back onto the screen."	
120	GOSUB 330	
130	KEYS(3)=CODE1:KEYS(4)=CODE2:CLS	
140	AS="A.Dat"	
150	FOR J=5 TO 9 STEP 2	
160	MID\$(AS,1)=CHR\$(65+(J-5)/2)	
170	LOCATE 10,15:PRINT"      Type the key to flash "AS" on the screen"	
180	LOCATE 11,15:PRINT"      (Use Control End if none)."	
190	GOSUB 330	
200	IF CODE1=0 AND CODE2=117 THEN GOTO 220	
210	KEYS(J)=CODE1:KEYS(J+1)=CODE2:CLS:NEXT J	
220	OPEN "SNAPSHOT.COM" AS #1 LEN = 1	'Open Snapshot.Com
230	LOCATE 5,30:PRINT"Creating Snapshot.Com"	
240	FIELD #1,1 AS BYTE.%.FOR N = 1 TO 606	
250	READ BYTE.%.IF BYTE.% <> -1 THEN GOTO 270	
260	FOR III=1 TO 10:LSET BYTE.%=CHR\$(KEYS(III)):PUT #1:NEXT III:GOTO 300	
270	IF BYTE.% <> -2 THEN GOTO 290	
280	FOR JJJ=1 TO 10000:LSET BYTE.%=CHR\$(32):PUT #1:NEXT JJJ:GOTO 300	
290	LSET BYTE.%= CHR\$(BYTE.%):PUT #1	
300	NEXT N:CLOSE #1	
310	LOCATE 5,30:PRINT "Snapshot.Com Created."	
320	END	
330	DEF SEG = &H40	
340	FKEY\$=INKEY\$:IF FKEY\$="" GOTO 340	
350	LOCATE 10,15:PRINT SPC(50):LOCATE 11,15:PRINT SPC(50)	
360	TAIL=PEEK(26):TAIL=TAIL-2:IF TAIL < 30 THEN TAIL = 60	
370	CODE1=PEEK(TAIL):CODE2=PEEK(TAIL+1)	
380	RETURN	

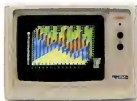
390	DATA	233,	31,	41,	40,	67,	41,	32,	83,	46,	32
400	DATA	72,	79,	76,	90,	78,	69,	82,	32,	49,	57
410	DATA	56,	53,	-1,	0,	0,	0,	0,	0,	0,	0
420	DATA	0,	0,	0,	0,	0,	0,	65,	46,	68,	65
430	DATA	84,	0,	0,	-2,	80,	83,	81,	82,	87,	86
440	DATA	30,	6,	156,	46,	255,	30,	41,	1,	187,	64
450	DATA	0,	142,	219,	139,	30,	28,	0,	59,	30,	26
460	DATA	0,	116,	100,	131,	235,	2,	131,	251,	30,	115
470	DATA	6,	187,	62,	0,	131,	235,	2,	139,	23,	46
480	DATA	141,	54,	22,	1,	46,	128,	62,	32,	1,	1
490	DATA	116,	123,	46,	59,	20,	116,	38,	131,	198,	2
500	DATA	46,	59,	20,	116,	61,	185,	3,	0,	46,	199
510	DATA	6,	33,	1,	160,	15,	131,	198,	2,	46,	59
520	DATA	20,	116,	123,	46,	129,	6,	33,	1,	208,	7
530	DATA	226,	239,	233,	160,	0,	137,	30,	28,	0,	46
540	DATA	198,	6,	32,	1,	0,	46,	199,	6,	33,	1
550	DATA	0,	0,	141,	6,	82,	41,	46,	163,	37,	1

(Figure 1 continues)

Figure 1: The BASIC program to create SNAPSHOT.COM.

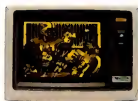
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# PROGRAMMING

```

560 DATA 232, 186, 0, 233, 129, 0, 137, 30, 28, 0
570 DATA 46, 198, 6, 32, 1, 1, 46, 199, 6, 33
580 DATA 1, 208, 7, 141, 6, 82, 41, 46, 163, 37
590 DATA 1, 232, 155, 0, 46, 199, 6, 33, 1, 0
600 DATA 0, 141, 6, 106, 41, 46, 163, 37, 1, 232
610 DATA 137, 0, 235, 81, 144, 46, 198, 6, 32, 1
620 DATA 0, 137, 30, 28, 0, 46, 199, 6, 33, 1
630 DATA 208, 7, 141, 6, 106, 41, 46, 163, 37, 1
640 DATA 232, 106, 0, 235, 50, 144, 137, 30, 28, 0
650 DATA 46, 198, 6, 32, 1, 1, 46, 255, 54, 33
660 DATA 1, 46, 199, 6, 33, 1, 208, 7, 141, 6
670 DATA 82, 41, 46, 163, 37, 1, 232, 70, 0, 46
680 DATA 143, 6, 33, 1, 141, 6, 106, 41, 46, 163
690 DATA 37, 1, 232, 54, 0, 7, 31, 94, 95, 90
700 DATA 89, 91, 88, 207, 82, 190, 2, 0, 38, 138
710 DATA 37, 71, 78, 131, 254, 0, 116, 7, 46, 136
720 DATA 167, 52, 1, 235, 239, 67, 90, 195, 82, 46
730 DATA 138, 167, 52, 1, 190, 2, 0, 38, 136, 37
740 DATA 131, 199, 2, 131, 238, 2, 67, 90, 195, 187
750 DATA 0, 176, 142, 195, 46, 139, 62, 35, 1, 46
760 DATA 139, 30, 33, 1, 185, 25, 0, 186, 80, 0
770 DATA 46, 255, 22, 37, 1, 74, 117, 248, 226, 243
780 DATA 195, 81, 82, 87, 139, 216, 185, 208, 7, 141
790 DATA 22, 118, 42, 180, 63, 205, 33, 139, 200, 180
800 DATA 62, 205, 33, 232, 80, 0, 141, 54, 118, 42
810 DATA 129, 249, 208, 7, 118, 3, 185, 208, 7, 128
820 DATA 60, 9, 117, 7, 131, 199, 8, 70, 235, 50
830 DATA 144, 128, 60, 13, 117, 37, 70, 73, 128, 60
840 DATA 13, 116, 5, 128, 60, 32, 114, 244, 131, 249
850 DATA 0, 126, 29, 65, 139, 199, 45, 212, 16, 178
860 DATA 80, 246, 242, 128, 252, 79, 119, 12, 71, 254
870 DATA 196, 235, 246, 129, 255, 68, 40, 115, 3, 164
880 DATA 226, 193, 95, 90, 89, 195, 128, 62, 51, 1
890 DATA 1, 117, 18, 86, 81, 141, 54, 118, 42, 185
900 DATA 208, 7, 46, 128, 36, 127, 70, 226, 249, 89
910 DATA 94, 195, 184, 0, 0, 142, 216, 161, 36, 0
920 DATA 46, 163, 41, 1, 161, 38, 0, 46, 163, 43
930 DATA 1, 199, 6, 36, 0, 68, 40, 140, 14, 38
940 DATA 0, 180, 15, 205, 16, 168, 4, 117, 7, 46
950 DATA 199, 6, 35, 1, 0, 128, 14, 31, 185, 3
960 DATA 0, 46, 141, 62, 212, 16, 141, 22, 45, 1
970 DATA 184, 0, 61, 205, 33, 114, 14, 232, 57, 255
980 DATA 129, 199, 208, 7, 139, 218, 46, 254, 7, 226
990 DATA 231, 186, 34, 42, 205, 39

```

(Figure 1 ends)

those used by your word processor or other programs you might want to have running together with Snapshot.

When you've named the five keys, the program will continue (for roughly two minutes) and will automatically generate SNAPSHOT.COM. After exiting BASIC, if you type SNAPSHOT the command will become memory resident, and the first time you press "N," it will store the present screen. You can change your chosen screen at any point simply by press-

ing "N" again. A subsequent "F" will then flash what has been stored back on; to return to your main task, you need only strike any other key.

When you run SNAPSHOT.COM, it also searches the current subdirectory for the data files A.DAT, B.DAT, and C.DAT. If A.DAT is not found, Snapshot stops searching for any more data files. If it is found, though, A.DAT gets loaded into memory and Snapshot starts looking for B.DAT. In just the same way, if B.DAT is

not found, the search stops; but if it is, it too is loaded into memory and Snapshot looks for C.DAT. Thereafter, when the correct trigger key is pushed for each of the three .DAT files, that file flashes up on the screen. Again, pressing any other key restores the screen without harm to any program then running.

The .DAT files can be created and updated with your word processor. If you intend to use WordStar, you should see the note at the end of this article about the mi-



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## PROGRAMMING

nor changes that must be made in the BASIC program. Each .DAT file should simply consist of a screenful of text: To see what it will look like when displayed, just TYPE it when you're in DOS.

For readers who prefer to work in assembler, a full commented listing is shown in Figure 2. Conceptually, there are only two major sections of Snapshot. The first part checks to see whether a trigger key has been typed and is now in the keyboard buffer. The second part puts the selected screens in place by writing them directly into the screen buffer.

### The Screen Buffers

Every character that appears on the screen has to be stored somewhere. Most modern monitors have some internal memory, and they store the screen contents there. The PC improves upon this system, however, by storing the screen contents in its own internal memory. The video-controller chip routinely scans this memory area and updates the screen.

If you have a monochrome screen, the screen buffer stretches from B000:0000 to B000:1000, a total of 4K (4096) bytes. There are 80 columns  $\times$  25 lines = 2000 positions on the screen, so each position can be given two bytes in the 4096 byte buffer.

One byte is used for the character's ASCII code, indicating which character is to be displayed at that location on the screen. The second byte for each position is named the attribute byte, and its code determines how the character will appear. In a normal display, the attribute byte has a value of 7H. The other possibilities, valid for either monochrome or color screens are:

Attribute Byte	Display
7H	Normal
87H	Blinking
70H	Reverse video
0FH	High intensity
FOH	Blinking reverse video

The graphics screen buffer starts at B800:0000. If you're using the PC's graphics facilities, you can address up to  $640 \times 200 = 128,000$  dots (pixels). Since each dot is represented by one bit (a bit can be either on or off and so can a dot), you

need 128,000 bits or 16,000 bytes. Thus, the graphics board contains a full 16K of memory to handle this substantial load. For displaying characters (that is, using the 80-column mode of the graphics board), only the first 4K bytes are used, as in monochrome.

Using DEBUG, you can drop in on both of these buffers. To interact directly with your monochrome screen buffer (address B000:0400), first clear the screen (type CLS for Clear Screen) and enter DEBUG. Then, ignoring the numbers that DEBUG will supply, enter the hex numbers shown below, with spaces between them.

```
>CLS
A>DEBUG
D:FE 0000:0400
D:FE:0400 20.40 70 4F 70 57 70 44 70 50 70
-C
```

Your screen should give you a friendly message as you enter these ASCII and attribute bytes. For graphics screens, of course, you'll use E B800:0000. If you're lucky enough to have both types of display, you can write directly to either this way, no matter which one the PC is using.

### The Keyboard Buffer

Whenever you strike a key on the PC, Interrupt 9 signals the 8088 that a character is waiting to be read. The PC does not have to stop immediately: it might in fact put the interrupt on hold, so to speak, if it is involved in something critical. If not immediately, however, then very shortly it will get around to executing the special keyboard interrupt subroutine contained in ROM.

The number the PC receives from the keyboard is, as you would expect, different for every key. This number is quickly interpreted, and the matching code for that key is put into the keyboard buffer.

The keyboard buffer consists of a group of 16 words in memory. One of these positions will hold the next character read from the buffer and is called the "head." Correspondingly, the "tail" is the position where the next character will be written to. If you type a character, the tail advances. When the PC reads one, the head advances.

Since both the head and the tail wrap around when they come to the end of the

buffer, the buffer can be likened to a ring of 16 words that acts like a puppy whose head is forever chasing its tail. When the head catches the tail and the two are at the same position, the buffer is empty. If the tail comes up from behind and reaches the tail comes up from behind and reaches the head, the buffer is full and the PC beeps.

Again, you can actually see some of the contents of the buffer by using DEBUG. Ignore the error message you get when you type in a string of Z's at DEBUG's hyphen prompt, and ask it to display 40:1A anyway, thus:

```
A>Debug
-2222222222222222
E:Z000
-040:1A
```

If you look at the right side of the screen you'll see DEBUG's ASCII conversion of what it found in the keyboard buffer at 40:1A. Included are a number of Z's, as intended, together with the D (display) command and the address.

For each character you recognize, however, there is one you won't, and this is because in addition to the character's ASCII code the PC slips in the key's scan code as well. (Type Q<CR> to end DEBUG.)

### Scan Codes and the Keyboard

The PC's keyboard is sufficiently sophisticated that it contains its own microprocessor (an Intel 8048). When you press a key, this microprocessor generates a number from 1 to 83, corresponding to which of the 83 keys was pressed.

Like any other piece of hardware, the keyboard communicates with the 8088 through its own port, which is one byte wide. Whenever an Int 9 is produced, BIOS reads in the scan code from the keyboard port. This number is then compared to a lookup table (the scan code table), which is located at F000:E896 in ROM. Both the scan code and the appropriate ASCII code are stored in the keyboard buffer. We can take a look at the scan and ASCII codes directly from the keyboard buffer by using a simple BASIC program:

```
10 FOR I=1 TO 16:KEY I;"NEXT I
20 DEF SEG = &H40
30 FREY=INKEY$:IF FREY="" GOTO 30
40 TAIL=PEEK(26):TAIL=TAIL-2:IF TAIL
   < 30 THEN TAIL = 60
50 CODE=PEEK(TAIL):CODE=PEEK(TAIL+1)
60 PRINT HEX$(CODE); SPC(1); HEX$(CODE+2)
   SPC(2);:GOTO 20:END
```

(continued)

# PROGRAMMING

```

INTERRUPTS      SEGMENT AT 0H      ;This is where the keyboard interrupt
                ORG                ;holds the address of its service routine
KEYBOARD_INT    LABEL    DWORD
INTERRUPTS      ENDS

SCREEN          SEGMENT AT 0B000H   ;A dummy segment to use as the
SCREEN          ENDS               ;Extra Segment

ROM_BIOS_DATA   SEGMENT AT 40H      ;BIOS statuses held here, also keyboard buffer

                ORG                LAH
HEAD            DW      ?           ;Unread chars go from Head to Tail
TAIL            DW      ?
BUFFER          DW      16 DUP (?)  ;The buffer itself
BUFFER_END      LABEL    WORD

ROM_BIOS_DATA   ENDS

CODE_SEG        SEGMENT
                ASSUME    CS:CODE_SEG
                ORG        100H      ;ORG = 100H to make this into a .COM file
FIRST:          JMP        LOAD_SNAPSHOT ;First time through jump to initialize routine

COPY_RIGHT      DB      '(C) S. HOLZNER 1985' ;An Ascii signature
KEYS            DW      5 DUP(0)
KEYS            DW      310EH,2106H,1E01H,3002H,2E03H ;A Sample: ^N,^F,^A,^B,^C
FLASHED         DB      0           ;Have we flashed a screenful? 1=yes
SNAPSHOT_OFFSET DW      0           ;Chooses 1st 250 bytes or 2nd
SCREEN_SEG_OFFSET DW      0         ;0 for mono, 8000H for graphics
IO_CHAR         DW      ?           ;Holds addr of Put or Get_Char
FILE_SIZE       DW      0           ;Read in this many bytes
OLD_KEYBOARD_INT DD      ?          ;Location of old kbd interrupt
FILE            DB      'A.DAT',0   ;Asciiz. Changed to B.Dat, etc.
WS_FLAG         DB      0           ;<-- Set to 1 to strip WordStar
SNAPSHOT        DB      10000 DUP (32) ;Storage for screens

SNAP            PROC    NEAR        ;The keyboard interrupt will now come here.
                ASSUME    CS:CODE_SEG
                PUSH      AX        ;Save the used registers for good form
                PUSH      BX
                PUSH      CX
                PUSH      DX
                PUSH      DI
                PUSH      SI
                PUSH      DS
                PUSH      ES
                PUSHF
                CALL      OLD_KEYBOARD_INT ;First, call old keyboard interrupt
                CALL      OLD_KEYBOARD_INT

                ASSUME    DS:ROM_BIOS_DATA ;Examine the char just put in
                MOV       BX,ROM_BIOS_DATA
                MOV       DS,BX
                MOV       BX,TAIL      ;Point to current tail

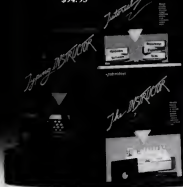
```

(Figure 2 continues)

Figure 2: The Assembler version of SNAPSHOT.COM.

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# PROGRAMMING

```

CMP      BX,HEAD      ;If at head, kbd int has deleted char
JE       IN           ;So leave
SUB      BX,2         ;Point to just read in character
CMP      BX,OFFSET BUFFER ;Did we undershoot buffer?
JAE      NO_WRAP      ;Nope
MOV      BX,OFFSET BUFFER_END ;Yes -- move to buffer top
SUB      BX,2         ;Point to just read in character
NO_WRAP: MOV DX,[BX]   ;** Typed character in DX now **
LEA      SI,KEYS      ;Point to Keys for search
CMP      FLASHED,1    ;Should we restore screen?
JE       RESTORE      ;Yes, jump there
CMP      DX,CS:[SI]    ;Compare to first key (Store screen)
JE       STORE        ;So Store
ADD      SI,2         ;Point to next key
CMP      DX,CS:[SI]    ;Second key -- should we flash screen?
JE       FLASH        ;Yes
MOV      CX,3         ;No -- check for .Dat keys (A.Dat,etc)
MOV      SNAPSHOT_OFFSET,4000 ;Point to beginning of .Dats in memory
TEST:    ADD SI,2      ;Increment to next key
CMP      DX,CS:[SI]    ;Is it right?
JE       DATS          ;Yes, flash a .Dat file on screen
ADD      SNAPSHOT_OFFSET,2000 ;Point to next .Dat
LOOP     TEST          ;And go back until all three are done
JMP      OUT           ;No keys matched. Jump Out.
STORE:   MOV TAIL,BX   ;Delete character from buffer
MOV      FLASHED,0     ;Switch Modes on Flashed
MOV      SNAPSHOT_OFFSET,0 ;Point to screen storage part of pad
LEA      AX,GET_CHAR    ;Make IO use Get_char so current screen
MOV      IO_CHAR,AX     ;is stored
CALL     IO             ;Store Screen
IN:      JMP OUT        ;Done here, let's go.
FLASH:   MOV TAIL,BX
MOV      FLASHED,1     ;Switch Modes, next key will restore screen
MOV      SNAPSHOT_OFFSET,2000 ;Point to screen storage part
LEA      AX,GET_CHAR    ;Make IO use Get_char so current screen
MOV      IO_CHAR,AX     ;is stored
CALL     IO             ;Store Screen
MOV      SNAPSHOT_OFFSET,0 ;Use 1st 250 bytes of Snapshot memory
LEA      AX,PUT_CHAR    ;Make IO use Put-Char so it does
MOV      IO_CHAR,AX
CALL     IO             ;Put result on screen
JMP      OUT            ;Done here.
RESTORE: MOV FLASHED,0 ;Restore screen from memory
MOV      TAIL,BX       ;Delete character from buffer
MOV      SNAPSHOT_OFFSET,2000 ;Point to storage part of memory
LEA      AX,PUT_CHAR    ;Make IO call Put_Char as it scans
MOV      IO_CHAR,AX     ;over all locations in screen
CALL     IO             ;Restore screen
JMP      OUT            ;And leave
DATS:    MOV TAIL,BX
MOV      FLASHED,1     ;Switch Modes, next key will restore screen
PUSH     SNAPSHOT_OFFSET ;Save this while Offset set for storing

```

(Figure 2 continues)

```

MOV     SNAPSHOT_OFFSET,2000      ;Point to screen storage part
LEA     AX,GET_CHAR               ;Make IO use Get_char so current screen
MOV     IO_CHAR,AX                ;is stored
CALL    IO                        ;Store Screen
POP     SNAPSHOT_OFFSET           ;Restore pointer to stored .Dat
LEA     AX,PUT_CHAR               ;Make IO use Put-Char so it does
MOV     IO_CHAR,AX
CALL    IO                        ;Put result on screen

OUT:    POP     ES                 ;Do the Pops of all registers.
        POP     DS
        POP     SI
        POP     DI
        POP     DX
        POP     CX
        POP     BX
        POP     AX

SNAP     IRET                      ;An interrupt needs an IRET
        ENDP

GET_CHAR PROC    NEAR             ;Gets a char from screen and advances position
        PUSH    DX
        MOV     SI,2              ;Loop twice, once for char, once for attribute
G_WAIT_LOW:
        MOV     AH,ES:[DI]        ;Do the move from the screen, one byte at a time
        INC     DI               ;Move to next screen location
        DEC     SI               ;Decrement loop counter
        CMP     SI,0             ;Are we done?
        JE      LEAVE            ;Yes
        MOV     SNAPSHOT[BX],AH   ;No -- put char we got into snapshot
        JMP     G_WAIT_LOW        ;Do it again
LEAVE:   INC     BX               ;Update location
        POP     DX
        RET

GET_CHAR ENDP

PUT_CHAR PROC    NEAR             ;Puts one char on screen and advances position
        PUSH    DX
        MOV     AH,SNAPSHOT[BX]   ;Get the char to be put onto the screen
        MOV     SI,2              ;Loop twice, once for char, once for attribute
        MOV     ES:[DI],AH        ;Move to screen, one byte at a time
        ADD     DI,2
        SUB     SI,2
        INC     BX               ;Point to next char
        POP     DX
        RET                      ;Exeunt
PUT_CHAR ENDP

IO       PROC    NEAR             ;This scans over all screen positions
        ASSUME  ES:SCREEN          ;Use screen as extra segment
        MOV     BX,SCREEN
        MOV     ES,BX

        MOV     DI,SCREEN_SEG_OFFSET ;DI will be pointer to screen position

```

(Figure 2 continues)

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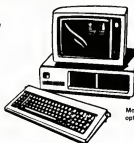
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# PROGRAMMING

```

MOV     BX,SNAPSHOT_OFFSET      ;BX will be location pointer
MOV     CX,25                   ;There will be 10 lines
LINE_LOOP:
MOV     DX,80                   ;And 25 spaces across
CHAR_LOOP:
CALL    IO_CHAR                 ;Call Put-Char or Get-Char
DEC     DX                      ;Decrement character loop counter
JNZ     CHAR_LOOP              ;If not zero, scan over next character
LOOP    LINE_LOOP              ;And now go back to do next line
RET     ;Finished
IO
ENDP

READ_FILE PROC NEAR ;Reads .Dats and formats in memory.
PUSH    CX ;Save used registers
PUSH    DX
PUSH    DI
ASSUME  DS:CODE_SEG,ES:CODE_SEG
MOV     BX,AX ;Put passed file handle in BX
MOV     CX,2000 ;Ask for 2000 bytes (Tops)
LEA     DX,DATA ;Point DS:DX at Data area at end
MOV     AH,3FH ;Ask for reading service
INT     21H ;And go get 'em
MOV     CX,AX ;Store number of bytes read
MOV     AH,3EH ;Now close file
INT     21H
CALL    WS ;Strip high bit if necessary
LEA     SI,DATA ;Transfer from CS:[SI] to DS:[BX] now
CMP     CX,2000 ;Make sure on number of bytes read in.
JBE     THE_LOOP ;Format file into Snapshot area now
MOV     CX,2000 ;Loop over character by character
THE_LOOP:
CMP     BYTE PTR [SI],9 ;Is it a tab?
JNE     NOTAB ;Add 8 spaces for tabs
ADD     DI,8
INC     SI ;And point to next character
JMP     CONT
NOTAB:  CMP     BYTE PTR [SI],13 ;Is it a carriage return?
JNE     OK ;No, store the character
FILL:   INC     SI ;Found a <CR>. Fill to end of line
DEC     CX ;Get rid of line feeds
CMP     BYTE PTR [SI],13 ;Treat additional <CR>s as new lines
JE      CR
CMP     BYTE PTR [SI],' ' ;Bona Fide character?
JB      FILL ;No, keep going past all linefeeds
CR:     CMP     CX,0 ;Yes, start to fill to end of line here
JLE     FIN ;Check on loop index
INC     CX ;And readjust it from skipping lf.s
MOV     AX,DI ;AH will check if we're at end of line
SUB     AX,OFFSET SNAPSHOT+4000 ;Get distance into screen
MOV     DL,80 ;Divide by 80 to find columns
DIV     DL
CHECK:  CMP     AH,79 ;Remainder of 79?
JA      CONT ;If more, have begun a new line.
ADD:    INC     DI ;Add a space by incrementing DI

```

(Figure 2 continues)



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CIRCLE 326 ON READER SERVICE CARD

# PROGRAMMING

```

        INC      AH          ;And keep track by incrementing AH too.
        JMP      CHECK       ;At edge of screen?
OK:      CMP      DI,OFFSET SNAP ;Past end of storage area? (Many tabs and CRs)
        JAE      FIN         ;Yes, don't move byte into it
        MOVSB
CONT:    LOOP     THE_LOOP    ;No, safe to move byte from [SI] to [DI]
FIN:     POP      DI          ;And keep going for all bytes in file
        POP      DX
        POP      CX
        RET
READ_FILE      ENDP          ;Exit here.

WS       PROC      NEAR      ;This will strip high bits from the
        CMP      WS_FLAG,1   ; read-in file if WS_Flag = 1
        JNE      RETWS      ;IF WS_Flag is not 1, exit
        PUSH     SI          ;Store used registers
        PUSH     CX
        LEA      SI,DATA     ;Point to read-in file
        MOV      CX,2000     ;Do 2000 bytes
ALOOP:   AND      BYTE PTR CS:[SI],127 ;Strip top bit
        INC      SI          ;Point to next one.
        LOOP     ALOOP       ;And keep going
        POP      CX          ;Pops
        POP      SI
RETWS:   RET
WS       ENDP          ;And Exit.

LOAD_SNAPSHOT      PROC      NEAR      ;This procedure initializes everything
        ASSUME    DS:INTERRUPTS ;The data segment will be the Interrupt area
        MOV      AX,INTERRUPTS
        MOV      DS,AX

        MOV      AX,KEYBOARD_INT ;Get the old interrupt service routine
        MOV      OLD_KEYBOARD_INT,AX ;address and put it into our location
        MOV      AX,KEYBOARD_INT[2] ;OLD_KEYBOARD_INT so we can call it.
        MOV      OLD_KEYBOARD_INT[2],AX

        MOV      KEYBOARD_INT,OFFSET SNAP ;Now load the address of our program
        MOV      KEYBOARD_INT[2],CS ;routine into the keyboard interrupt

        MOV      AH,15        ;Ask for service 15 of INT 10H
        INT      10H          ;This tells us how display is set up
        TEST     AL,4         ;Is it?
        JNZ      READ        ;Yes - jump out
        MOV      SCREEN_SEG_OFFSET,8000H ;No - set up for graphics display
        PUSH     CS           ;Now read in A.Dat, B.Dat etc.
        POP      DS          ;Set DS correctly
        MOV      CX,3         ;Loop over three files
        LEA      DI,SNAPSHOT+4000 ;Store starting in this area
LOOP:    ASSUME    DS:CODE_SEG ;Loop over files
        LEA      DX,FILE      ;Point to file name
        MOV      AX,3DH       ;Service 3DH, attribute 0 for file
        INT      21H          ;Open file
        JC       EXIT        ;If not found, exit

```

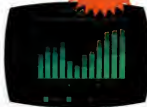
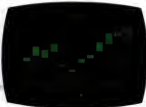
(Figure 2 continues)

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# PROGRAMMING

```
CALL READ_FILE ;Pass file handle in AX to Read_File
ADD DI,2000 ;Point to next storage area
MOV BX,DX ;Change A.Dat into B.Dat etc.
INC BYTE PTR CS:[BX] ;A.DAT-->B.DAT etc.
LOOP LOOP ;Keep going over all files.
EXIT: MOV DX,OFFSET LOAD_SNAPSHOT ;Set up everything but LOAD_SNAPSHOT to
      INT 27H ;stay and attach itself to DOS

LOAD_SNAPSHOT END
DATA: CODE_SEG ENDS

END FIRST ;END "FIRST" so 8888 will go to FIRST first.
```

(Figure 2 ends)

The program will wait until you type a key and will then give you both that key's ASCII code and its scan code (both in hex) directly from the keyboard buffer. Thus, if you type A, the program will return 41 1E, the ASCII and scan codes for A, respectively, in hex.

## Enter Snapshot

When an Int 9 is generated, Snapshot checks the new character in the keyboard buffer to see whether or not to flash up one of its own screens of data. It has stored all the trigger keys specified in creating SNAPSHOT.COM, and each entering

key is checked against this list. If a typed key matches, Snapshot jumps in, saves the current screen (so it can restore it later), then displays the screen that was requested. Then it watches for another key to be typed, which it interprets as a command to restore the original screen.

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## Final Notes

Since Snapshot lives and breathes via Interrupt 9, it follows that programs that steal this interrupt will be incompatible. Unfortunately, foremost among these pilferers is *XyWrite II-Plus*, the word-processor of choice at *PC Magazine*. Sorry, gang.

If you intend to use *WordStar* as your word processor, you'll have to make two changes to the BASIC program of Figure 1 before you run it. The first is in line 30. The checksum shown there must be changed from 51461 to 51462. This is to reflect the second necessary change, which is in the list of DATA numbers in line 430. The third number in that series, just to the left of the -2, must be changed from its original value of 0 to 1.

The effect of these changes is to activate a *WordStar* "stripper" feature of the program. Unlike ASCII, *WordStar* often sets the 8th bit of a character byte high (1). The

result is that *WordStar* files cannot be displayed intelligibly on the screen once you have left *WordStar*. (Try using TYPE

Since Snapshot lives and breathes via Interrupt 9, it follows that programs that steal this interrupt will be incompatible. Unfortunately, foremost among these pilferers is *XyWrite II-Plus*.

from DOS on a *WordStar* file if you haven't seen this phenomenon.) The program change indicated here resets the highest bit (if *WordStar* did leave it set), so you will be able to display *WordStar*-generated screens in other programs. I did not

simply build the stripping feature permanently into the code since it would also strip out all the "quasi-graphic" IBM monochrome symbols, which also use the high bit, and some readers who don't use *WordStar* may wish to be able to save these.

Assembly language users will note that a WS\_FLAG byte is provided in that listing, as well. Further, if you use the assembler version, you will have to supply the trigger key definitions, comparable to those shown in the commented-out KEY DW line. The short BASIC program above will give you the ASCII and scan codes to enter for any choice of keys. For instance, 'N' will give you E 31. Since the PC stores words with the low byte first, you would enter this as 310EH in Snapshot's KEYS data area. ■

Steve Holzner is a contributing editor of *PC Magazine*.

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# Spreadsheet Clinic

This forum offers our readers an opportunity to exchange the quick fixes, simple solutions, and fancy footwork that make their spreadsheets work better.

## Let There Be Color

Have you ever wished you could change the colors that Lotus uses? All it takes is a little DEBUG work on the TD.DRV file in 1-2-3 and the LOTUS.SET file in Symphony. These are the device-driver files that you installed on your disks when you first configured the program. There are five areas in Lotus products that use color that you can modify: background, cursor, border, unprotected cells, and the cursor when it is in an unprotected area.

The chart in Figure 1 lists the addresses of the bytes in the device drivers that control color and also gives Lotus's default values at these addresses.

In 1-2-3, the cursor and border are always the same color, while in Symphony the border and unprotected cells are the same. This is why the chart only has four addresses and byte values.

To change the colors in 1-2-3, for example, put your program disk in drive A: and a disk with DEBUG.COM on it in drive B:. Proceed as follows.

At the A> prompt, type

B:DEBUG TD.DRV <enter>

At DEBUG's—prompt, type

d17d180 <enter>

This will display the default values. At the—prompt, type

e17d <enter>

This will display the contents at that address and allow you to change values. Type a new value for contents at this address to obtain your desired color. Hit the space bar and the value of the next address

will appear. Type a new value.

Continue until you have typed four values and then hit the Enter key.

At the—prompt, type

w<enter>

DEBUG will tell you how many bytes it is writing.

At the—prompt, type

q<enter>

This will take you out of DEBUG and back to the A> prompt.

Now load 1-2-3 and see what happens.

The procedure is the same with Symphony, only you do the DEBUG operation on the LOTUS.SET file and use different addresses.

Joseph Abbott  
Philadelphia, Pennsylvania

*This procedure works fine, though I was disappointed that it doesn't affect the colors used in graphs.*

*The value at each address, by the way, is composed of two single-digit numbers, not a single two-digit number. Thus, in 1-2-3, the number at address 17d controls not only the background color but also the color of characters in the control panel. If*

*you change it to 3F, for example, you will get a light-blue background and high-intensity white characters.*

*The number for the cursor works the same way. Change the value at address 17e to 1C and you will get a blue border with high-intensity red cell coordinates. You get the same colors when you move the cursor to a cell with characters in it.*

*For those of you who don't know color numbers by heart, here is a little hex table.*

0-black	8-gray
1-blue	9-high-intensity blue
2-green	A-high-intensity green
3-light blue	B-high-intensity lt. blue
4-red	C-high-intensity red
5-purple	D-high-intensity purple
6-brown	E-yellow
7-white	F-high-intensity white

*You needn't be uneasy about tackling your device driver with DEBUG. The original files are still on your Lotus utility disk, and you can always re-install them if you make a terrible botch of things.*

*Experiment until you find the color combination you like best—and then wow your friends with your exotic version of Lotus. Be careful when using the high-intensity colors (especially when in the first po-*

	1-2-3		Symphony			
	Ver. 1a*		Ver. 1.0		Ver. 1.01	
Background	Address	Value	Address	Value	Address	Value
Cursor	17d	07	985	07	19f9	07
	17e	30	986	30	19fa	30
Unprotected Cells	17f	1e	987	0a	19fb	0a
Cursor in Unprotected Cells	180	28	988	20	19fc	20

Figure 1: Default values for Lotus colors and their addresses.

sition): certain combinations will create blinking characters; not the kind of visual effect that will help improve your spreadsheets.

### Extended Characters in 1-2-3

In the last column (PC, Volume 4 Number 13), we published a BASIC program that writes 1-2-3 printer control codes or the IBM extended character set to a disk file. If you read that file into a worksheet with the /File Import Text command, you can then

A circular error, one of the greatest frustrations for 1-2-3 users, means a cell function uses its own value in a calculation.

copy any of those characters anywhere within the worksheet, for printer control or fancy graphic effects.

Here's a different way to do the same thing; it uses 1-2-3's translation utility instead of BASIC. What will our readers think of next?

You can use the following procedure to use the IBM extended character set and printer control characters from within a worksheet. The procedure involves creating the special characters outside of 1-2-3 and then loading them in as needed.

Step 1. Create a dummy worksheet with "place holder" cells where you would like special characters to appear. The cell entries should be text; for example, the letter Z.

Step 2. Save the worksheet and call it EXTEND.

Step 3. Exit 1-2-3 and enter the TRANSLATE utility.

Step 4. Convert the worksheet (EXTEND.WKS) to DIF (EXTEND.DIF).

Step 5. Exit Lotus entirely.

Step 6. Use a word processor that lets you use the entire IBM character set (Volkswriter Deluxe, for example) and retrieve the file EXTEND.DIF.

Step 7. Go through the file and where you find a Z, change it to the character or printer-control code that you want to put in your spreadsheet.

Step 8. Save the file, using the same name (EXTEND.DIF).

Step 9. Return to the 1-2-3 TRANSLATE utility and convert the now modified DIF file to WKS (EXTEND.WKS). Use the columnwise translation option.

Step 10. Exit the TRANSLATE utility, enter 1-2-3, and retrieve the translated file (EXTEND.WKS).

You can now use the /Copy command to move these characters wherever you may need them within the worksheet. If you have a printer like the Hewlett-Packard LaserJet that uses very long printer codes, you may have no choice but to embed the codes within your worksheet, because the printer-setup string is limited to 39 characters.

You can also create fancy borders, dramatic warning messages, or customized help screens. You should realize, though, that many of the characters you see on the screen will not print on your printer unless it is mapped to the IBM character set.

An easy way to use the characters and control codes is to put them all in a single worksheet and store it on your data disk. By assigning appropriate range names (such as the ASCII numbers), you can use the /File Combine command to retrieve the characters you want. A macro, such as the following, will work nicely:

```
/fcon{?} filename
```

Rob Graebe  
Houston, Texas

This is an attractive alternative to the procedure we discussed in the last issue. I used Xywrite II to modify the DIF file. A few of the extended characters mysteriously refused to appear in the WKS file, but I got most of what I wanted. Maybe other word processors will behave a little differently.

Since the WKS to DIF to WKS translation process is cumbersome, I used Xywrite to create a plain ASCII text file containing the extended characters, and then read it into 1-2-3 using the /File Import Text command. Only a few of the extended characters came through properly. Apparently the translation is a necessary step. However, if you follow Mr. Graebe's advice and keep the whole character set in a worksheet on disk, you'll only use the translation procedure once.

A very nice tip.

### Fixing Circular Errors in 1-2-3

Circular errors are one of the greatest frustrations for the 1-2-3 user. You know you've got a circular error when you see the letters CIRC highlighted at the bottom of the screen. It means that a cell formula uses its own value in a calculation or that several formulas depend on each other to arrive at a value.

Figure 2 shows a simple example. The formula in cell B4 includes itself as one of the values to be summed, so there is no proper way to compute the total. The CIRC message means you have made this kind of mistake and warns you that the numbers in your worksheet may be wrong. In this example, it's easy to find the problem and correct it (move the formula in cell B4 out of the range B2..B8), but in a large worksheet, the offending formula may be very hard to track down.

The following procedure can help to find a circular error. First save your worksheet twice; one copy for storage and one for trouble-shooting. Now the hunt can begin. Bring up the trouble-shooting copy and put 1-2-3 into auto-recalc mode. This way you can see the results of your hunt immediately. Now go through the spreadsheet and delete formulas.

In my experience, @sum formulas are good ones to start with because they are the usual culprits. Often the only way to make rapid progress in your search is to delete whole chunks of your worksheet—one at a time. Check the bottom of the screen after every deletion. When the CIRC message finally goes away, you know you've found the part of the spreadsheet that's causing the problem.

A		B
1		
2		5
3		7
4		@sum(B2..B8)
5		6
6		8
7		3
8		4
9		
10		

Figure 2: An example of a circular error.

Now you can call up a fresh copy of the worksheet and narrow your search until you find the bad cell.

Bruce Bassin  
Northridge, California

*This is a clumsy, trial-and-error way to hunt for circular errors, but it's the only one I know that works. When you delete whole chunks of your worksheet, you may produce ERR messages in the cells that remain, but that makes no difference; the problem that caused the circular error will still be there.*

*Since 1-2-3 is smart enough to know a circular error when it sees one, you'd think it'd be smart enough to highlight it for you, too. Maybe next version.*

#### Don't Justify Named Ranges

Don't use range names when you justify labels. The command `"/Range Justify named-range <enter>` will wipe out your range name.

John Patterson  
Pensacola, Florida

*It won't really wipe out your range name; 1-2-3 still remembers it. If you try a `/Range Name Delete` command, for example, 1-2-3 will list the range name on the command line. However, the range is no longer valid, and when you try to do something with it (copy, move, etc.), 1-2-3 will tell you that it's an illegal range. This is a case of a perfectly legal range being made an outlaw by having its contents rearranged.*

*The same thing will happen if you use the normal cell address technique to justify labels that happen to contain a named range. 1-2-3 will still remember the range but will tell you it's illegal any time you try to do something with it. The moral of the story: Justification and named ranges don't mix.*

#### Contribute to the Clinic

Share your latest spreadsheet discovery through PC's Spreadsheet Clinic. We'll pay you \$50 if you submit it on a disk. If you send a disk, please include a printout of your submission.

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# Power User

With this first installment of Power User, PC Magazine encourages readers to share their best hardware and applications software discoveries.

## Programming with Word

I do about an equal amount of documentation and programming, and *Microsoft Word* with a mouse is super for both. But, it does have a major failing for programming: *Word* can count pages and paragraphs but not line numbers! Unfortunately, our Pascal compiler (also *Microsoft*) prints error messages with line number references, and finding the errors in the source file with *Word* is difficult.

But, there is an answer! Go to the Gallery, select or insert a normal division style in the Style Sheet you use for programming, and set the page length to 1.67 inches. Also you should set the top and bottom margins to 0 inches and the page numbering to start at 0.

From then on, after you load a source file, select Print Repaginate. Your document will be paginated to 10 lines per page. If you are looking for line X, jump to page (X div 10). For example, if you want line 93, you must jump to page 9, and you will find it 2 lines down.

Too bad you have to use such a kludge for program editing. If they ever fix it, I

hope they'll also include an optional auto-indent mode for programming.

Russell L. Schnapp  
San Diego, California

*Your cure works fine and makes for an interesting application of Word's Style Sheets. Another way to achieve the same thing is to set Options to Measure in P12 units (units of 12-pitch type) and then set the page length to 20, which is an even number and easier to remember than 1.67.*

*Style Sheets are one of Word's best features. You can also use them to set up auto-indented paragraphs, which may do what you want for programming. The next letter may give you a clue.*

## Word as an Outline Processor

There is much interest in outline-processing software, but for those of you with only an occasional use for outlining, you can use a Style Sheet in *Microsoft Word*, which handles the job nicely and saves the price of an outline program. OUTLINE.STY handles five levels of indentation (more can easily be added if needed), with

- |   |   |   |
|---|---|---|
| 1 | G1 Division Standard  | blank sheet   |
|   | No break. Page length 11", width 8.5".  | Pollux Arabic. Top margin 1.25", bottom 1.5", left 1.25", right 1.25". Top running head at 0.5". Bottom running head at 0.5". Footnotes on same page. |
| 2 | 1 Paragraph Standard  | sit-1 1st level   |
|   | Pica (modern a) 12. Flush left, Left indent 0.5" (first line indent -0.5"), space after 1 li. Tabs at: 0.5" (left flush), 5.7" (right flush). |   |
| 3 | 2 Paragraph 4   | alt-2 2nd level indent  |
|   | Pica (modern a) 12. Flush left, Left indent 1" (first line indent -0.5"), space after 1 li. Tabs at: 1" (left flush).                         |   |
| 4 | 3 Paragraph 5   | alt-3 3rd level indent  |
|   | Pica (modern a) 12. Flush left, Left indent 1.5" (first line indent -0.5"), space after 1 li. Tabs at: 1.5" (left flush).                     |   |
| 5 | 4 Paragraph 6   | sit-4 4th level indent  |
|   | Pica (modern a) 12. Flush left, Left indent 2" (first line indent -0.5"), space after 1 li. Tabs at: 2" (left flush).                         |   |
| 6 | 5 Paragraph 7   | sit-5 5th level indent  |
|   | Pica (modern a) 12. Flush left, Left indent 2.5" (first line indent -0.5"), space after 1 li. Tabs at: 2.5" (left flush).                     |   |
| 7 | C Paragraph 54  | ATZ-C centering   |
|   | Pica (modern a) 12 Bold Uppercase. Centered, space after 2 li.  |   |

Figure 1: A Style Sheet in *Microsoft Word* that can turn the program into an outline processor.

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## POWER USER

the necessary tab stops to ensure that all headings and paragraphs are correctly aligned. See Figure 1.

To activate OUTLINE.STY, select Format Style, and choose Sheet. Then enter OUTLINE or use the right arrow to select OUTLINE from the files menu. To change the level of the outline, start a new paragraph and type Alt plus the number of the outline (or indentation) level. You can cut and paste between different levels of the outline, and reformatting the paragraph is a simple two-key step.

If you set the Options Style Bar to Yes, the paragraph-formatting commands will be visible on the left edge of the screen. The way OUTLINE.STY is designed, the formatting commands tell you the current outline level.

Ivri Kumin, M.D.  
New Orleans, Louisiana

*Now that's a Style Sheet I can use! It's also helpful to new Word users trying to set up Style Sheets for the first time, so we're putting it up on PC Magazine's Interactive*

*Reader Service (at [212] 696-0360), along with your guide on how to use it. See Figure 2 for a sample of how it works.*

### A Low-Tech Fix for Brother's Miscue

The "paper-out" sensor used with the tractor feed on Brother printers can cause trouble. The printer will be printing along just fine and then go off-line for no apparent reason.

The problem is that the height of the paper-out sensor (it's under the paper at the rear of the printer) is set too low. When the paper is fed rapidly, such as when a form feed is issued, the paper arches up, and the sensor takes the printer off-line.

The solution is to carefully bend the thin metal band that acts as the sensor so it

I'm not enamored of fixing things by "bending soft metal parts." Software can often fix hardware problems and is a better solution to your problem.

sits higher above the printer body. You must be careful not to break it, since this is soft metal.

Kenneth M. Chipps  
Fort Worth, Texas

*While your solution works, I'm not enamored of fixing things by "bending soft metal" parts. They can easily break, and modifying them can void your warranty.*

### A Better Way

Software can often fix hardware problems, and a balky paper-out sensor is no exception. Here's a better solution to the problem:

I often find myself writing short letters that I prefer to print on a single-sheet paper in my Epson MX100 printer. Unfortunately, the printer's paper-out switch causes the printer to stop printing before the letter is done.

I could use BASIC to send the printer command sequence to disable the paper-out switch (CHRS(27)+"8"), but that requires keeping BASIC.COM on my word

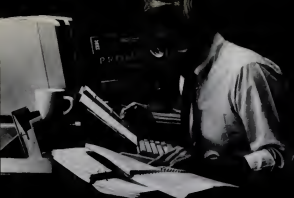
Each level of the outline can have numbers and letters attached also, just press Tab after the number or letter. For example:

- I. This is an example of a first level indentation...
  - A. A second level indentation...
    - 1. a third level indentation of more than one line of text, which is automatically tabbed and indented to the right spot
    - 2. another third level indent
      - a. a fourth level indentation...
        - 1) and so forth...
        - 2) and so on...
        - 3) indefinitely.
  - B. Back to the second level. Easy.

Figure 2: A sample printout using OUTLINE.STY.

```
-A ; Start Assembling
0B28:0100 MOV DL,1B ; ESC
0B28:0102 MOV AH,05 ; DOS Function
0B28:0104 INT 21 ; Call DOS
0B28:0106 MOV DL,38 ; "8"
0B28:0108 INT 21 ; Call DOS
0B28:010A INT 20 ; Return to DOS
0B28:010C ; Press ENTER
-N PAPEROUT.COM ; Name the program
-RCX ; Load the CX Reg
CX 0000
:0C ; with a hex 12
-W ; Write the file
-Q ; Quit
```

Figure 3: A .COM program to disable an Epson paper-out switch.

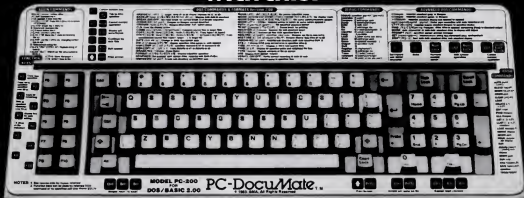


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processing disk. A better solution is a 12-byte .COM program (Figure 3) that is easy to create with DEBUG.

The "..." marks are DEBUG's prompts. You can ignore the comments when you're typing the program in, and don't worry if the number to the left of the colon (current code segment) is different on your system—it probably will be, owing to your different configuration.

Running this program before printing disables the paper-out switch and offers the luxury of printing on single sheets.

Larry Lowry  
Tacoma, Washington

*Right you are. This works fine, and if you want, you can create a companion (PAPERIN.COM) program that re-enables the paper-out switch when you go back to tractor-feed paper. Just replace the "8" on the fourth line of PAPERIN.COM (38H) with a "9" (39H).*

```

100 'Program to Make .COM Programs for Printer Command Sequences
110 '***** by J. Thomas Gannon. - *****
120 COLOR 7,1:CLS:LOCATE 5,1:GOTO 1
130 INPUT "Enter .COM File Name:>";AS: IF AS = "" THEN 130
140 OPEN "O",1,AS+".DAT"
150 PRINT #1,"A"
160 PRINT #1,"NOV AR,5"
170 PRINT:PRINT "Enter Printer Command Sequences:"
180 PRINT TAB(4); " " Ordinary Characters or Punctuation Marks"
190 PRINT TAB(4); " " 2 or 3 Digit Numbers for ASCII Character Codes"
200 PRINT TAB(4); " " (Use leading zeros for one digit numbers):PRINT
210 PRINT "Press [ENTER] to quit":PRINT
220 PRINT:INPUT "Enter Character or 2/3-Digit ASCII Code:>";CS
230 IF CS = "" THEN GOTO 300
240 IF LEN(CS) > 1 AND VAL(CS) > 0 OR CS="00" THEN GOTO 260
250 CS = STR$(ASC(CS))
260 OS = HEX$(VAL(CS)): IF LEN(OS) = 1 THEN OS = "0" + OS
270 PRINT #1,"MOV DL,"OS
280 PRINT #1,"INT 21"
290 I = 1 + 1: GOTO 220
300 PRINT #1,"INT 20":PRINT #1,"":PRINT #1,"RCX"
310 N = (1 - 1) * 4 + 4
320 PRINT #1,HEX$(N)
330 PRINT #1,"M"
340 PRINT #1,"Q"
350 CLOSE
360 OPEN "O",1,AS+".DAT"
370 PRINT #1,"OEBUS 10.COM < 10.0AT"
380 PRINT #1,"DEL 10.DAT"
390 PRINT #1,"DEL 10.DAT"
400 CLOSE
410 SYSTEM

```

**Figure 4:** A PRINPREP BASIC program to create a .COM file that will send instructions to a printer while in DOS.

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(Bill Machrone is the editor of PC Magazine.)

PC Magazine  
November 27, 1984

“It is setting new standards for quality and performance in the dot matrix arena.”

Computers & Electronics Magazine  
November 1984



#### Better Yet...

*This letter describes an even more general way to "quickly" write .COM programs that send command sequences to your printer:*

In your April 2, 1985, User-to-User column, John Lawson presented a way to send printer instructions while in DOS by using DEBUG to create a COM file. A BASIC program I've called PRINPREP

makes this almost effortless; see Figure 4.

The PRINPREP program creates a file, named whatever you want, with a file-name extension of ".DAT", which contains the responses that DEBUG requires to create the COM file. It also creates a BATCH file (same name, but with a .BAT extension) that starts DEBUG using the .DAT file for input. When you run the .BAT program and DEBUG is done, you have a .COM file of the same name, and the .BAT and .DAT files are gone.

J. Thomas Denison  
Orange, Texas

*Great program! You can use it to send any printer command sequence you need to use. Just keep entering the ASCII characters or character codes.*

*You need to send codes for control characters, especially escape (which is character 27). Two or three digit numbers will be treated as ASCII character codes,*

```
Enter .COM File Name:>paperout
```

```
Enter Printer Command Sequences:
```

- \* Ordinary Characters or Punctuation Marks
- \* 2 or 3 Digit Numbers for ASCII Character Codes  
(Use leading zeroes for one digit numbers)

```
Press [ENTER] to quit
```

```
Enter Character or 2/3-Digit ASCII Code:>27
```

```
Enter Character or 2/3-Digit ASCII Code:>8
```

```
Enter Character or 2/3-Digit ASCII Code:>
```

Figure 5: This printout of a BASIC session demonstrates how PRINPREP works.

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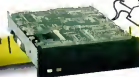
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## POWER USER

```
DEBUG %0.COM < %0.DAT
DEL %0.DAT
DEL %0.BAT
```

Figure 6: PRINPREP output includes PAPEROUT.BAT.

```
A
MOV AH,5
MOV DL,1B
INT 21
MOV DL,38
INT 21
INT 20
```

```
RCX
C
W
Q
```

Figure 7: PAPEROUT.DAT will be used to create PAPEROUT.COM.

and single digit numbers will be treated as an ordinary character.

For an example of what PRINPREP.BAS can do, see the BASIC session with PRINPREP, in Figure 5, and the .DAT and .BAT files it generates for creating Larry Lowry's PAPEROUT.COM program (Figures 6 and 7, respectively). If you run PAPEROUT.BAT, it will use PAPEROUT.DAT to create PAPEROUT.COM.

New users should be aware that you'll get an error message from DOS when PAPEROUT.BAT finishes up—it's erased itself by then and DOS gets somewhat lost. It's nothing to worry about—just go ahead and use PAPEROUT.COM!

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# User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.

## WordStar Fix Refixed

In PC, Volume 4 Number 4, I offered a method to give the original WordStar a destructive backspace key and a Del key that kills the character at the cursor. ("Yet Another WordStar Fix" on page 259 of User-to-User.) The fix worked fine on the 3.3 Version, but, as a swarm of letters proved, not at all on earlier editions. My apologies to the frustrated; let's try again, and I'll even offer something special for 3.3 users.

Put a spare copy of WS.COM in drive B:, and a copy of DEBUG.COM in drive A:. At the A> prompt, type DEBUG B:WS.COM.

In case you've got some sort of version of WS.COM I don't know about, the rule for making the backspace destructive is: look at addresses 52B and 52C and put their respective contents into 49B and 49C. I've already looked at Versions 3.20, 3.24, 3.3, and 3.31 to find the first pair of addresses, so you can skip that step. At the hyphen prompt, enter:

E 49B

For Version 3.20, DD should appear; type in 7E. For Version 3.24, EI should appear; type in 82. For Versions 3.3 and up, DD should appear; type in AE.

Next, for all versions, hit the spacebar. For Version 3.20 and 3.24, 7C should appear; type in 82. For Versions 3.3 and up, 7E should appear; type in 83.

The rest of the show is the same for all versions. First you fix the left arrow key to keep it from getting violent. Hit the Enter key to get back to the hyphen prompt. Then enter:

E 686

08 should appear; type in 13 and hit the Enter key. Now on to the Del key (3.31 users can skip this step).

Enter:

E71C

7F should appear. Type in 07 and hit the Enter key and you're done.

Now for the new development. A thoughtful letter from J. Weaver, Jr. of Monroe, Michigan, points out that the above changes disable the Ctrl-Q-Del combination's erase-from-cursor-to-left-margin function. His proposed patch, alas, disables the identical function of Ctrl-Q-Bksp, but his suggestion inspired me to find a way to get both and a dividend besides. So enter:

E53E

1F should appear. Type in 07 and hit the Enter key. Now you've got a choice of three different ways to erase back to the beginning of the line: Ctrl-Q-Del, Ctrl-Q-Bksp, and (watch out when finding text!) Ctrl-Q-G.

Type W and hit the Enter key. DEBUG will give you a message about how many bytes it's writing to disk. After that, all you have to do is enter Q to quit, and your WordStar will sing.

WS customizing fans will discover more patches than they may have dreamed of and much more otherwise unavailable information in a book/disk package called *UnderGround WordStar*. I have more than a token involvement with it, so I'm admittedly not a disinterested observer. It's available for \$19.95 plus \$2.00 for postage and handling only by mail and only for the IBM PC and fully compatibles from Hard/Soft Press, Box 1277, Riverdale, NY 10471.

Stephen Manes  
Riverdale, New York

*This fix covers all the bases. Now any user of WordStar can have a destructive backspace without making the left-arrow key a killer as well.*

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## USER-TO-USER

### Automated DOS Menus

The assembly language program CHOOSE.COM along with the batch file MENU.BAT can provide you with a simple way to eliminate repetitive typing of those DOS commands that you use most frequently. These two programs let you assign your most often used program names, batch files, or DOS commands to single-key menu entries.

MENU.BAT displays a menu on the screen (by TYPEing MENU.SCR) and then invokes CHOOSE.COM.

CHOOSE.COM uses function 4C hex of interrupt 21 hex to set the DOS ERRORLEVEL value in response to a struck key. MENU.BAT then evaluates the user's choice via the IF ERRORLEVEL subcommand. CHOOSE.COM can set the ERRORLEVEL to any value, 0-9.

When using the IF ERRORLEVEL command in your batch files, always check the numbers in descending order because any value that is below or equal to the actual ERRORLEVEL value will return a true reading.

Paul Berry  
Berlin, New Jersey

*This is a spiffy way to create menus, since it saves the user the trouble of needing to hit the Enter key after each numerical menu selection is made. We wrote the small CHOOSE.BAS BASIC program in Figure 2 to create the .COM file directly if users don't want to assemble the CHOOSE.ASM listing in Figure 1. To use this, you'll need the CHOOSE.COM file (which you get either by running CHOOSE.BAS or assembling CHOOSE.ASM), your own MENU.SCR file, and your own MENU.BAT file. You can easily adapt the ones in Figure 3. When these four files are on your disk, just type MENU to start the ball rolling. Or include MENU as a command in your AUTOEXEC.BAT file.*

### A Better INKEY\$

It's possible to access extended functions (cursor keys, Ctrl key combinations, etc.) through the BASIC INKEY\$ system variable. This takes more understanding of the mechanics of INKEY\$ than IBM is willing to describe in its BASIC or Technical Reference manuals, however. In addition, IN-

Code	segment	para	'code'
	assume	CS:Code	
	mov	ax, 0000	
	int	16h	
	cmp	ah, 02	
	je	One	
	cmp	ah, 03	
	je	Two	
	cmp	ah, 04	
	je	Three	
	cmp	ah, 05	
	je	Four	
	cmp	ah, 06	
	je	Five	
	cmp	ah, 07	
	je	Six	
	cmp	ah, 08	
	je	Seven	
	cmp	ah, 09	
	je	Eight	
	cmp	ah, 0Ah	
	je	Nine	
	cmp	ah, 0Bh	
	je	Zero	
	mov	al, 00h	
	jmp	out	
One:	mov	al, 01	
	jmp	out	
Two:	mov	al, 02	
	jmp	out	
Three:	mov	al, 03	
	jmp	out	
Four:	mov	al, 04	
	jmp	out	
Five:	mov	al, 05	
	jmp	out	
Six:	mov	al, 06	
	jmp	out	
Seven:	mov	al, 07	
	jmp	out	
Eight:	mov	al, 08	
	jmp	out	
Nine:	mov	al, 09	
	jmp	out	
Zero:	mov	al, 00	
	jmp	out	
J	out:	mov	ah, 4ch
		int	21h
Code	ends		

Figure 1: Assembler listing for CHOOSE.COM.

KEY\$ distinguishes between uppercase and lowercase letters, something that occasionally forces the user to look for both in IF... THEN filters.

Programmers can use the machine-code subroutine in the INKE.BAS pro-



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### USER-TO-USER

```
100 ' CBOOSE.BAS -- Crestes CHOOSE.COM DOS menu
110 DEFINT A-Z:TOTAL=0
120 FOR A=1 TO 114:READ A$:B=VAL("&B"+A$):TOTAL=TOTAL+B:NEXT
130 IF TOTAL<12866 THEN PRINT "check your typing!";END
140 RESTORE
150 OPEN "CHOOSE.COM" FOR OUTPUT AS #1
160 FOR A=1 TO 114:READ A$:PRINT #1,CHR$(VAL("&B"+A$)):NEXT
170 CLOSE:PRINT "CHOOSE.COM created"
180 END
190 DATA B8,88,88,CD,16,88,FC,82,74,32,88,FC,83,74,32,88
200 DATA FC,84,74,32,88,FC,85,74,32,88,FC,86,74,32,88,FC
210 DATA 87,74,32,88,FC,88,74,32,88,FC,89,74,32,88,FC,8A
220 DATA 74,32,88,FC,8B,74,32,88,8B,33,98,8B,81,EB,2E
230 DATA 98,88,82,EB,29,98,88,83,EB,24,98,88,84,EB,1F,98
240 DATA 88,85,EB,1A,98,88,86,EB,15,98,88,87,EB,18,98,88
250 DATA 88,EB,EB,98,88,89,EB,86,98,88,88,EB,81,98,84,4C
260 DATA CD,21
```

Figure 2: BASICA CHOOSE.BAS program to create CHOOSE.COM.

```
REM MENU.BAT
echo off
cls
type menu.scr
echo *** Choose Function ***
choose
if errorlevel 8 goto end
if errorlevel 7 basics draw5/M:&BFF50
if errorlevel 6 advent me ~
if errorlevel 5 basics keys
if errorlevel 4 talk128
if errorlevel 3 turbo
if errorlevel 2 ws
if errorlevel 1 dbase mailst.prg
:end
cls
```

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5. Basic
6. Adventure Game
7. Draw Pictures
8. Exit To DOS

Figure 3: MENU.BAT batch file (top) and MENU.SCR display (bottom). Adapt these to suit your needs and make sure the 1 through 8 entries match in both.

```
100 ' INKEYNEW.BAS -- by Jon M. Etheredge
110 DATA 55,89,E5,8B,78,6,8B,76,8,31
120 DATA C8,31,DB,CD,16,88,E3,38,24
130 DATA 89,5,89,F7,89,1D,5D,CA,4,8
140 CLEAR,&HEFFF:DEFINT A-Z:INKE=&HEFFF
150 FOR X=1 TO 29
160 READ A$:A=VAL("&B"+A$):POKE X,&HEFFF,A
170 NEXT X
180 PRINT "Now start hitting keys..."
190 PRINT "CODE";ASC(6);"CHR$(ASC(6))"
200 CALL INKE (CODE,ASCII)
210 PRINT CODE,ASCII,CHR$(ASCII)
220 GOTO 200
```

Figure 4: INKE.BAS program that returns the ASCII value and extended code for any key pressed.



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gram in Figure 4 instead of INKEY\$. There are lots of ways to do this, but the one illustrated in INKE.BAS POKES values out of DATA statements directly into memory (in this case into a protected area high in the default segment for BASIC). When CALLED, the subroutine returns the ASCII code of the key pressed in the variable ASCII and the extended code in the variable CODE.

Notice that the CODE variable is the same for each key whether or not the up-

percase or lowercase version of it was typed. This makes for much more direct manipulation of key inputs than INKEY\$ and at a cost of only 29 bytes.

Jon M. Etheredge  
Fredericksburg, Virginia

*This technique makes it easy to use such keys as the Function keys, cursor arrows, Del, Ins, Home, and so forth for program control. And, it makes it a snap to pose "Yes/No" or "Choose A, B, or C" questions without having to use the four or five popular tricks to make the response insensitive to the case of the letter entered.*

### Color-Conscious CLS

Users of RGB monitors often use utilities such as Peter Norton's SCRATR to set screen colors while in DOS. Unfortunately, the DOS CLS command not only clears the screen, it also resets the color adaptor back to the default white on black. Even Norton's CLEAR.COM program has the same effect.

The short CL.COM program (see Figure 5) provides a solution to this problem. It will clear the screen but will not change the current screen attributes.

Brad Stephenson  
Jenison, Michigan

*CL.COM is an improvement over the CLS command for users with color systems. Around the PC Magazine offices, most of us rely on a User-to-User oldie called COLOR.COM, which sets the colors and clears the screen. Figure 6 contains instructions for creating COLOR.COM in any combination of colors.*

```
A>debug cl.com
File not found
-a 100
xxxx:0100 mov ah,00
xxxx:0102 mov bh,00
xxxx:0104 int 10
xxxx:0106 mov bh,ah
xxxx:0108 mov ax,0000
xxxx:010B mov cx,0000
xxxx:010E mov dx,104f
xxxx:0111 int 10
xxxx:0113 mov ah,02
xxxx:0115 mov bh,00
xxxx:0117 mov dx,0000
xxxx:011A int 10
xxxx:011C int 20
xxxx:011E
-RCX
CX 0000
-10
Writing 001E bytes
-q
```

**Figure 5:** Instructions for creating CL.COM, which clears the screen without disturbing the existing color attributes. Type in everything underlined, and hit the Enter key at the end of each line (including the one above -RCX). Ignore every xxxx; the hex numbers that appear there will vary from system to system.

```
A>debug
-a color.com
-a 100 2b c8 1e 58 b8 03 00 cd 10 b8 00 05 b2 00 00 ba
-a 110 58 20 b7 01 cd 10 b4 02 ba 00 00 b7 00 cd 10 b8
-a 120 ** ba d9 03 00 cd 20
-RCX
CX 0000
-27
-W
Writing 0027 bytes
-q
```

**Figure 6:** The COLOR.COM program sets screen colors in DOS. Type in everything underlined, with spaces between the pairs of hex numbers following the e 100, e 110, and e 120. Hit the Enter key at the end of each line. IMPORTANT: I'm actually enter ## and \*\*—instead pick the colors you want by substituting the proper hex value of the background/foreground colors. For blue letters on white, replace the ## with a 71; for white on blue replace it with 17; for brown on red, replace it with 46. Then replace the \*\* with the hex value of the border color. For a light-blue border, replace the \*\* with 03; for light green, replace it with 02; for bright red, replace it with 0C.

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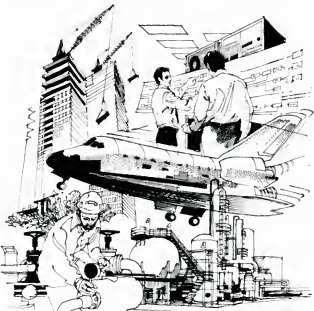
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## USER-TO-USER

```
10 OPEN "BELL" AS #1 LEN=1
20 FIELD 1,1 AS B$
30 LSET B$=CHR$(7)
40 PUT 1,1;CLOSE;END
```

**Figure 7:** BEEPER.BAS program that creates a DOS BELL file. After running the program, get into DOS and enter TYPE BELL.

### DOS Bell

The program in Figure 7 lets you "ring" the bell on your IBM computer at the DOS level. It's often handy to signal the end of a batch process such as a long compilation or to alert the user that something is amiss. It's easy to create a file to do this if you have the IBM Assembler or if you write a BASIC file and then compile it, but these methods require an Assembler or BASIC compiler, and they produce unnecessarily large code.

Once you've created the file, you can enter the command

### TYPE BELL

and the beep will sound—or you can add this command to a batch file.

Richard K. Meyers  
Oakland, California

Actually, it's simple to create this file in DOS. Just type COPY CON BELL (and hit the Enter key) then hold down the Alt key and hit the 7 key on the cursor pad—not the one at the top row—and then release the Alt key, then hit the F6 function key and then the Enter key. When you enter the Alt-7, you should see a 'G' on the screen. To beep, just type: TYPE BELL.

You could also create a batch file called BELL.BAT where the first line was ECHO OFF and the second ECHO 'G', using the same Alt-7 trick as above. If you do this, make sure you hit the Enter key after both lines. This will let you beep just by entering BELL, but it also puts an ECHO OFF on the screen.

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# PC Tutor

This second of two installments looks at BASIC's handling of floating-point numbers.

At the end of the last column we saw how software using binary rather than decimal representation increases both arithmetical range and precision.

The situation with floating-point numbers is harder to describe, but the end result is essentially the same. In floating-point arithmetic, the average error involved in representing a floating-point number is lower if the computer thinks in binary (hexadecimal).

This may need some explanation, however, for one result of using binary notation was that BASIC had a bit of "trouble" when it was first released. While one would expect that  $10 \times 0.3 = 3.0$ , this does not necessarily happen when using binary languages.

The reason for the seeming inaccuracy in floating-point calculations can be easily demonstrated using decimal notation. Consider the equation

$$1 - 3 \times (1/3) = x$$

You would think  $x$  could only be 0, but consider the way a 4-digit decimal language might do the arithmetic.

$$\begin{aligned} 1/3 &= .3333 \\ 3 \times (1/3) &= 3 \times .3333 = .9999 \\ 1 - 3 \times (1/3) &= 1 - .9999 = 0.0001 \end{aligned}$$

In fact, if the floating-point routines were written poorly, that last statement could even be as bad as

$$\begin{aligned} 1 - 3 \times (1/3) &= 1 - .9999 = \\ 1.000 - 0.999 &= 0.001 \end{aligned}$$

This would occur if the third step required that each number be represented by a 4-digit number, which would drop off the last "9" digit.

In reality, it takes a tougher test to cause the binary floating-point routines in IBM's current BASIC to conk out. If you're interested in doing so, however, you might try

```
PRINT $ - 25 * (2/25 + 3/25)
```

We, who can scan the algebra, can see

that the answer should be 0, but the computer cannot. (Some high-level computer languages do support algebraic reduction, but that's a separate issue.)

Conclusion: computer languages generally process numbers internally in binary. This increases the range of the arithmetic, decreases roundoff errors, and reduces the number of overflow errors. Binary representation, however, may sometimes cause unexpected results since noncomputer people think in decimal.

To avoid this last difficulty, some business languages (notably C-BASIC) use decimal notation internally, thus ensuring that dollars and cents line up. Although that makes sense at first blush, consider some arithmetic such as

purchase 1 item at .3 for \$1.00  
or 1 for .33 (.347)

In any problem involving division, the greater number of digits made available by using binary rather than decimal representation internally will yield potentially greater accuracy.

As we've seen above, an integer can be represented internally in many different forms. Here we must discuss two standards: the IBM BASIC representation and the IEEE proposed standard (used by the 8087 coprocessor implementation). In each case, there are different levels of precision, which allow tradeoffs between storage and accuracy requirements, just as there are when you select between single- and double-precision in BASIC or FORTRAN.

The IEEE (Institute for Electrical and Electronics Engineers) is an august body that, among other things, tries to set standards for the industry. This is a worthwhile task since it promotes transportability between different manufacturers' hardware and different language writers' compilers and interpreters.

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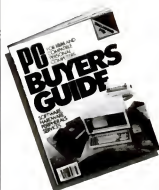
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## PC TUTOR

IBM's implementation of the 8087 is almost completely IEEE compatible, both in data format and in the algorithms it uses to compute errors due to rounding, overflow, and truncation. I know this because, among other reasons, I once had a number of sophisticated numerical-analysis programs running on an Amdahl mainframe computer in APL. When these applications were moved to the IBM PC, they worked without modification. What is more, the answers were identical to the 14th decimal place because the language on the Amdahl and the language on the PC used the same floating-point format.

For some reason, however, IBM BASIC does not adhere to the IEEE standard, so we need to know two different formats to understand floating-point math on a PC. The various formats appear in Figure 1.

As you examine Figure 1 you will see that IEEE short real format has the same overall characteristics as single-precision IBM BASIC (although the two are not absolutely identical). The IEEE long real format, however, is very different from double-precision BASIC, even though both representations use the same number of bits. The IEEE long real uses more bits for the exponent and fewer for the mantissa. Thus, IBM's double-precision BASIC is more precise (number of digits of precision) but has less range than the IEEE long real.

You may wish to note in passing that for business applications the IEEE defines a data type called packed BCD (Binary Coded Decimal). This is our old friend the decimal-language representation. Packed

BCD consists of an 18-digit fixed-point number (which requires 9 bytes to store and process), with the 10th byte reserved for the sign [+ or -] of the number.

Returning to floating-point notation, one useful question to consider is this: What does a known mantissa, sign, and exponent in binary notation translate into in decimal terms? The equation for this is as follows:

$$X = \text{sign} * .\text{mantissa} * (2^{\text{exponent}})$$

The period (.) here before the mantissa signifies that the mantissa comes after the decimal point (base 2). Thus, for example, suppose we have a sign of +1, a mantissa of C000 hex and an exponent of 12 hex. The number is then

$$+1 * .\text{C000} * (2^{12}) \text{ (hexadecimal)}$$

or (in decimal)

$$+1 * .75 * (2^{10}) = 196608.$$

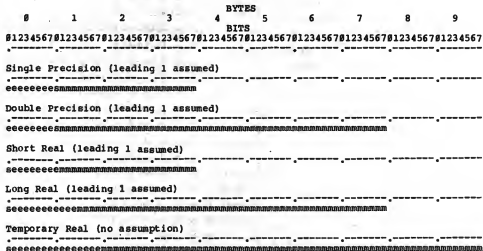
Why is .C000 equal to .75? Consider that in decimal .3 is 3/10; in hex .C is C/10 or 12/16 = .75 in decimal.

Since the sign can be only plus 1 or minus 1, this is often encoded as a single bit (off/0 == -1, on/1 == +1). Further, in base 2 the mantissa must begin with a 1. (Otherwise you could start one digit to the right and decrease the exponent, gaining more bits of precision.) Thus, sometimes the leading 1 is omitted from the representation entirely.

To get a feeling for which bits are which in floating-point math, the table in Figure 2 uses the following codes:

Name	Number of Bits	Range	Mantissa Bits	Exponent Bits
<b>IBM BASIC:</b>				
Integer	16	32767	-	-
Single	32	1E+38	24	8
Double	64	1E+38	56	8
<b>IEEE (8087):</b>				
Word Int.	16	32767	-	-
Short Int.	32	1E+9	-	-
Long Int.	64	1E+19	-	-
Packed BCD	80	1E+18	-	-
Short Real	32	1E+38	24	8
Long Real	64	1E+308	53	11
Temp. Real	80	1E+4932	64	15

Figure 1: The standard representations for floating-point integers; IBM BASIC and IEEE.



**Figure 2:** A representation of how bits and bytes are assigned for storage of a floating-point integer.

s = sign bit  
m = mantisse bit  
e = exponent bit

For the 8088, byte 0 is usually stored at the highest address and the rightmost byte at the lowest address. Further, in order to be able to represent negative exponents, the actual exponent is calculated by taking the binary (unsigned value) and subtracting a bias. The bias values are

```
BASIC Single Precision. .128
      Double Precision. .128
IEEE  Short Real. . . . 127
      Long Real . . . . 1023
      Temporary Real. .16383
```

Figure 3 contains a short program that will allow us to see just how the various pieces of a floating-point number fit together when we're using IBM single-precision BASIC.

Suppose that the printout from the program gives us the following decimal numbers:

125  
117  
194  
142

What is the value of xxx?

First, we know that the exponent is stored in byte 0 (single precision), so the exponent is 125 to 128 decimal (bias of

```

5  ' Assignment
10 J = 0 : N = 0 : ' so varptr works, set all scalars
20 FLOAT = .xxx : ' surprise (actually, I used 0.12)
30 J = VARPTR(FLOAT) : ' where is the number?
35 ' Single Precision = 4 bytes to examine
40 FOR N=3 TO STEP -1 : ' since bytes are stored backwards
50 PRINT PEEK(N+J) : ' read the bytes that make up FLOAT
60 NEXT N
70 END

```

**Figure 3:** A program to demonstrate how floating-point integers are used by BASIC.

128). Thus, the first part of the puzzle is

$$2^{-3} = .125 \text{ (exponent portion)}$$

The sign bit is the first bit of byte 1. Since  $\text{17 decimal} = 75 \text{ hexadecimal}$ , we can deduce that the first bit is a 0, so we can tell that the result is positive. How? If the first hex digit were 8 or greater, the first bit in the byte would be a 1, and the sign would be negative. The second piece thus becomes

$$+1 \cdot 2^n - 3$$

Finally, we remove the first bit (0 anyway) and add to that byte the leading 1 that was implicit, and we get the bytes

```
byte 1 = 75 + 80 (hex) = F5 hex
byte 2 = 194 (decimal) = C2 hex
byte 3 = 143 (decimal) = 8F hex
```

In this way, our mantissa becomes .F5C28F hex. Note the decimal place: .F5C28F = F5C28F/1000000(hex). The mantissa takes up 6 hex digits (24 bits), so when we put everything together, we have, finally,

+1 \* (F5C28F/1,000,000) \* (2^n-3) hex

In decimal, this is 0.1199999..., which is fortunate since, in point of fact, I had actually set `FLOAT` to 0.12 originally to get the numbers for the example.

As you can see, understanding how IBM BASIC handles even single-precision floating-point arithmetic is no piece of cake. However, if interest warrants, I'll go into more detail about the 8087 routines in a future column. ■

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# For Equation Processing Only

Volkswriter Scientific, a scientific word processor, can't handle such basic functions as file editing, but it can successfully process equations. It also offers a rich assortment of symbols and impressive output.

Writing and science are uncomfortable bedfellows. Most writing is hard, but science writing is especially agonizing because of three major headaches: equations, tables, and footnotes.

A specialized word processor can make science writing easier, however, if it can enter equations, use special symbols, arrange data neatly in a table, and automatically place footnotes. The perfect scientific word processor has yet to be made, but a package that calls itself a "scientific word processor" should be able to handle at least one or two of these special abilities and should, most definitely, be able to handle word processing basics.

## No Text File Editing

Surprisingly, Lifetree Software's *Volkswriter Scientific*, an offspring of a highly regarded general-purpose word processing program, *Volkswriter Deluxe*, may be able to help you if you need equation processing, but it can't do plain text file editing or most other chores. For



example, the program couldn't even alter my AUTOEXEC.BAT file to disable the print spooler. *Volkswriter Scientific* requires 256K RAM and my PL has 256K with 64K dedicated to a print spooler. Editing the AUTOEXEC.BAT was an ideal first task for *Volkswriter Scientific*, and it failed.

*Volkswriter Scientific* cannot edit an AUTOEXEC.BAT file or any other plain text file for several reasons. First, it can edit only files whose extensions are .VSF. In addition, you must use its VSUTIL program to import text files and convert them into a format that can be used by *Volkswriter Scientific*. And, finally, it has no text-file export facility. Thus, you can't convert files back to another format for use with any other program, telecommunicate your files to some other package, submit them to a

programming language compiler, or use them as DOS batch files.

*Volkswriter Scientific* cannot even do the simple task of removing a single line from a six-line ASCII file. No way! I've used about two dozen word processors, from micros to mainframes, yet I've never encountered another program that was beaten by a six-line text file.

## Limited Abilities

A handful of other simple tasks also stumps *Volkswriter Scientific*. For instance, I entered a four-line poem all on one line. It took considerable effort to rearrange the poem so that each line of the poem was on a separate line of the document. Moving text is a very awkward process—you must hit the Ins key three times and then make menu selections. The most ridiculous limitation of the program is that you can't change your margins once you have entered text. A document can contain sections with different margins, but once a you enter a given line with given margins, those margins are forever.

How is *Volkswriter Scientific* for tabular data or for footnotes? Not good. Tabular data requires adept handling of tabs so that you can easily change column widths, and footnotes require built-in logic so that space can be reserved for them. *Volkswriter Scientific* strikes out on both of these tests.

Another complaint I have is that *Volkswriter Scientific* is page oriented. Within a single page (about three screenfuls) it's easy to work, but you're going to need help from the Almighty if



**Volkswriter Scientific**  
Lifetree Software, Inc.  
411 Pacific St.  
Monterey, CA 93940  
(408) 373-4718  
List Price: \$495

Requires: 256K RAM, DOS 2.0 or higher, color/graphics adapter, and parallel graphics printer on LPT1.

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your table or equation, straddles a page boundary. Moving text or actually any movement from one page to another is both awkward and time consuming because *Volkswriter Scientific* first saves one page and fetches another.

### The Bells and Whistles

*Volkswriter Scientific's* strength is writing equations, and to this end, it offers a rich assortment of Greek, mathematical, and engineering symbols. Text comes in two sizes, medium and large; numbers come in three sizes, small, medium, and large; and the special characters are only available in medium. Many of the special characters are designed for stacking so that you can make large braces, boxes, and so forth. The program displays text and formulas on the screen exactly as they will be printed, and all of the typesfaces are proportionally spaced. The program's proportionally spaced text display is the most Macintoshlike of any package I've seen that is designed for use on the PC.

Simple equations are easy to enter, but complicated formulas require extreme patience. After successfully entering and formatting several equations, I decided that this package really needs a mouse so that you can position elements of formulas without entering endless micropositioning commands. Also, the micropositioning commands are only for horizontal motion; the smallest vertical motion is one-half line. With an hour or so of practice, I began to become fluent in equation layout, but, at best, it's a tedious process. I have used much easier equation layout programs, but *Volkswriter Scientific* does the job. Its output is impressive and belies the labor that is involved in creating the effect.

### Pretty as a Picture

*Volkswriter Scientific* requires a graphics printer for output and impressively prints your documents as if they were pictures—it isn't limited by the character set that is built into a dot matrix printer. It also faithfully prints double-high letters, special graphics symbols, and so forth. The printers it supports include the HP Thinkjet, the IBM Graphics printer, the Epson FX-80 (with or without Graftrax), the Toshiba P1340 and P351, and the NEC 8023. Printing times range from a tolerable 52 seconds per page for draft quality on the Thinkjet to 6 minutes of eternity for a page in high-quality mode on the NEC 8023. No other printers are supported—no plain-vanilla printers at all. What happens if your graphics printer is in the shop for a week and you need a rough copy of your document?

The 70-page tutorial created by the program was printed by a Toshiba P1351 and then reduced. The program's scarcity of size selections makes it hard to achieve typesetter quality, but the manual is proof that hard work can produce impressive publication-quality results. *Volkswriter Scientific's* lowercase font is easily readable, but I was less impressed with the uppercase letters; they looked too squarish and seemed to be a different type style than the lowercase letters.

### A Galling Limitation

*Volkswriter Scientific* requires that you use a parallel printer connected to LPT1. Because the PC has five equally valid connections for a printer, I have little respect for a program that is so inflexible that it only works with LPT1. More-

over, the program bypasses DOS to access the printer. Thus, it is impossible both to redirect printer output with the DOS MODE command and to use most of the popular print spoolers. The company mentions this galling limitation in

The filename limitations in this package are truly bizarre. The program limits filenames to eight characters and does not allow disk prefixes.

the introduction of the manual but not in the system requirements paragraph of the spec sheet. Because of this limitation, I was unable to print the equations that I laboriously constructed.

Yet another limitation of *Volkswriter Scientific* is its inability to use DOS pathnames. The filename limitations in this package are truly bizarre. The program limits filenames to eight characters and does not allow disk prefixes, DOS pathnames, or suffixes. In VSUTIL, however, the rules are a bit different: filenames can be up to ten characters; disk prefixes and pathnames are not allowed; and a mere one character is allowed as an extension. I have never seen a more restrictive program or used one that limits you to one-character extensions instead of DOS's three-character standard.

### Tedious Procession

*Volkswriter Scientific* works adequately if all you want is an equation-entering package. Its main disadvantage for equation processing, besides the tedium, is that you can't construct your own symbol libraries. For standard word processing chores, I would prefer a less dictatorial word processor. Obviously, the design goal of *Volkswriter Scientific* is equation entry, but I wouldn't recommend that you spend \$495 for a package that has bells and whistles without the basics.

Kaare Christian is a frequent contributor to PC Magazine.

### Maxwell's equations:

$$\nabla \cdot \mathbf{D} = \rho \quad \nabla \cdot \mathbf{B} = 0 \quad \nabla \times \mathbf{E} = - \frac{\partial \mathbf{B}}{\partial t} \quad \nabla \times \mathbf{H} = \frac{\partial \mathbf{D}}{\partial t} + \mathbf{J}$$

$$\int \frac{dx}{\ln x} = \ln(\ln x) + \sum_{n=1}^{\infty} \frac{(\ln x)^n}{n n!} \quad \left\{ G_{\alpha\beta} = 8\pi T_{\alpha\beta} \right\}$$

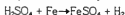
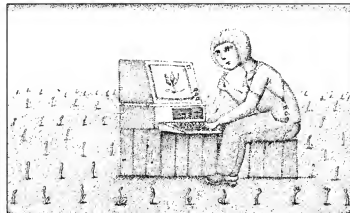


Figure 1: An untouched excerpt from a *Volkswriter Scientific* printout produced by the NEC 8023 printer.

# Heavy-Duty PC Forecasting

These six forecasting programs could make your mainframe obsolete for all but the largest problems. Top honors go to Alpha Software's ESP package, which offers everything from time series to regression models.



If your job requires a lot of business forecasting, you undoubtedly waste plenty of time waiting for the company mainframe to run your models. And the wait is probably even more annoying when you've made only minor changes to your forecasts. Now, however, you can bypass the mainframe with forecasting software for the PC.

Here's a survey of six heavy-duty forecasting programs that will help you cut your mainframe ties (see "Forecasting: The PC's Latest Trend," *PC*, Volume 4 Number 13 for a look at software for the occasional forecaster.)

## Eyeball Forecasting

*Smart Forecasts* from Smart Software lets you fiddle with forecasts to your heart's content using a unique interactive graphics function called eyeball forecast-

ing. This function plots forecasts against the history of the data so that you can compare them. It also shows confidence intervals around the forecasts.

Using the cursor and function keys, you can move the forecast graphs around until they look right. You can also graph several alternative forecasts on screen.

*Smart Forecasts* offers both time series and regression models, excellent documentation, an on-line tutorial, and context-sensitive help screens. Smart Software's customer service people are also very helpful.

*Smart Forecasts* does have some annoying problems. For instance, data entry is so clumsy that I had to build DIF files in 1-2-3 and import them to *Smart Forecasts*. I also object to the way the program implements some of the time series models. These models are based on

weighted moving averages (also known as exponential smoothing) that have a big impact on forecast accuracy, but *Smart Forecasts* forces you to choose the best weights subjectively. The program should automatically make the best choice for you.

*Smart Forecasts* does have a crude procedure to do an automatic search for weights, but you can't use it unless you run a "forecasting tournament" of five different models at once. The tournament is a good idea, but the program implements it poorly. Two of the five models in the tournament cannot handle trends. If the plot of the data does not show a trend, why should these models be included in the tournament? And why bother with a tournament if you already know the best model for the data?

## Statistical Tools

Unlike Smart Software's offering, *Forecast Plus* automatically searches for the most-accurate weights. It also gives you statistical tools to help you identify

## PC FACT FILE

### Smart Forecasts

Smart Software  
392 Concord Ave.  
Belmont, MA 02178  
(617) 489-2743  
List Price: \$495

Requires: 256K RAM, color/graphics adapter, color display (RGB recommended), two disk drives, DOS 2.0 or higher.

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## BUSINESS

the best model for a set of data and analyze the forecasts.

Unfortunately, *Forecast Plus* has its share of irksome flaws as well. In fact, it has many of the problems that are associated with old-fashioned forecasting on a time-sharing system. If you direct output to the screen, it scrolls by too fast to read it. As a result, the only way to make full use of this program is to dump all output to the printer or a disk file. But, if you do this, you get another jolt from the old days: the graphics are teletype-style, nothing more than scatter diagrams printed sideways, with asterisks for plotting symbols.

Obviously, the authors of *Forecast Plus* did not take the time to learn the PC—a shame because *Forecast Plus* is a powerful program.

### Regression Forecasting

If you are new to regression forecasting or want to brush up your skills a bit, you should try McGraw-Hill's *MicroTSP*. The *MicroTSP* manual, actually an introductory textbook, explains the basics of regression using a variety of case studies: forecasting telephone demand, auto sales, Treasury Bill interest rates, and Holiday Inn's revenues. The pro-

gram includes a library disk with all data for the case studies.

The cases are real-world problems, not contrived examples. For the Holiday Inn case, you develop a model to forecast gross revenues based on information from the company's annual reports (including occupancy rate, average revenue per occupied room, and number of rooms in the system) and government economic statistics (including GNP, unemployment, and the interest rate on prime commercial paper). The manual clearly discusses why this data is relevant and which models apply. Then it walks you step by step through the runs. If you foul things up, the program helps you recover by giving you complete listings of all input and output.

### TSP's Little Brother

*MicroTSP* is the little brother of the popular *TSP* program for mainframes, so most commands are the same. The main difference between the programs is that *MicroTSP* is interactive, while *TSP* is a batch program. But, you can use *MicroTSP* in a batch mode if desired. The batch mode is handy if you have a number of regressions to run on a repetitive basis, such as once a month as new data comes

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### Forecast Plus

Walton Associates  
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Minneapolis, MN 55423  
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List Price: \$595  
Requires: 128K RAM, two disk drives.

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### MicroTSP 3.2 and 4.0

McGraw-Hill Book Co.  
1221 Avenue of the Americas  
New York, NY 10020  
(212) 512-2000

List Price: 3.2, \$395; 4.0, \$595  
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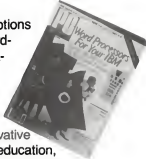
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in; you can set up a macro-like facility to automatically execute the same commands when you boot the programs.

**MicroTSP** comes in two flavors. Version 3.2 is strictly a regression program; 4.0 offers both regression and time series models. But watch out—the time-series models in 4.0 are complex and probably too difficult for business people without a good background in statistics.

## Skimpv Documentation

Two new programs by Stratix, *Nuametrics* and *Xtrapolator*, would be good buys if the company would only document them. *Nuametrics* is a regression program, and *Xtrapolator* includes a variety of extrapolation models. Though both are strictly menu-driven and easy to use, if you have questions about the numerous statistics supplied by each program or about anything else, you're out of luck. But if you have a good background in statistics and are familiar with forecasting models, you can benefit from both programs, and you may not find the missing documentation that much of a disadvantage.

## A Class Act

**ESP—The Econometric Software Package** originated on mainframes, but this PC version makes the mainframe obsolete for all but the largest forecasting problems. *ESP* has all the important computational features of the mainframe version and can be assisted by an 8087 coprocessor for greater speed. I won't attempt to catalog all the models available, but it offers everything from time series models to simultaneous-equation regression models.

*ESP* is strictly a class act. Its key features include an on-line tutorial, on-line help, and a macro capability that is really an extensive programming language. The developers paid special attention to data management. Files can be imported and exported in just about any format, including the internal format for 1-2-3, or WKS. If you have ever had to go back and change a bunch of WKS files to ASCII or DIF format, you will appreciate this feature. You can even access Chase Econometrics' historical and forecast data on-line.

If forecasting is a major part of your job, you should choose between *Smart Forecasts* or *MicroTSP*, depending on whether you need both time series and regression or regression only. However, if

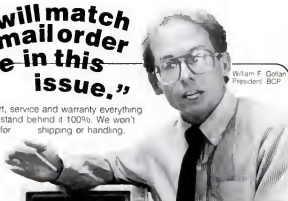
you are a pro, you should definitely buy *ESP* to cut your mainframe ties. ■

*N.B. Forrest is an independent business consultant in Carlisle, Pennsylvania.*

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# California-Style Computer Curriculum

Computech, a Fresno "magnet school" for grades 7 and up, made computer science the cornerstone of its curriculum and desegregated the school district in the process.

There's a middle school in Fresno, California, where students write term papers on IBM PCs using *EasyWriter II*. French teachers keep track of grades on PCs in the classroom; students can check (but not change) their grade records any time they like. PCs help students compute data from science experiments and print out lab reports. It is a school where learning to use the computer is not so much a goal in itself as a tool for coping with the future.

In fact, the stated objective of the Fresno Academy of Computer Technology (Computech for short) is "to infuse technology into all areas of the curriculum while providing specific academic instruction in math, science, and computer science."

## Magnet School

This middle school has taken the leap into technological education as an innovative answer to the need for desegregation in the Fresno community. In 1983, Fresno Unified School District created Computech as a "magnet school," with a dazzling array of computer programs and an impressive staff, to draw children from the affluent white families at the north end of town to the predominantly black Edison High School in west Fresno. In fact, Computech is a school within a school that shares its campus with Edison's.

Computech's program was set up for grades 7 through 9 in September of 1983. In 1984 a 10th grade was added, and a grade will be added each year until it becomes a 6-year curriculum.



Fresno Unified spent half a million dollars the first year and another \$200,000 the second year to provide Computech's enticing facilities. The school boasts 86 Apple IIe computers networked among classrooms and offices with two Corvus Omninet disk servers; one lab containing 30 Radio Shack Model IV's and another with 30 IBM PCs; a total of 21 printers; IBM PCs in most classrooms for grades and recordkeeping; 6 Hayes Smartmodems; 4 large-screen (50-inch) TVs; and accessories such as light-pens, digitizers, plotters, Koala pads, and robots. The software library includes classroom sets of *EasyWriter II*, Lotus's 1-2-3, *Typing Tutor*, *VisiCalc*, *MultiPlan*, and many other programs.

Computech's computers are not confined to the classrooms. The library

prints out overdue notices and checkouts by classroom, on a system that runs on an Apple IIe using *OverdueWriter*, a software package for library management. Software for managing the inventory, stocking, and planning for Computech's lunch program is undergoing revision by the State Department of Food Services and will be implemented as soon as the changes are finalized.

## Philosophy of Futurism

The basis of all these high-tech trap-pings is a philosophy of futurism. School administrators hope to prepare Computech graduates to work in the four clusters of related industries—electronics and computers, space, the oceans, and biological applications—that Alvin Toffler, in his book *The Third Wave*, says will become the backbone of the economy of the future.

Computech's basic curriculum includes the social sciences, math, English, science, and physical education with electives in foreign languages, music, art, and a variety of other subjects. There is a band, a string ensemble, a newspaper, many after-school clubs, and an active sports program.

But to top off the basic curriculum, computers at Computech enhance classroom activities. Science experiments are monitored by, among other devices, a Port Interface Box (made by Sci-Comp) that measures temperature, resistance, frequency, and light intensity. Word processing is a part of English and history, and electronics enters biology class as powerful microscopes project their im-



## EDUCATION

ages onto large screens viewable by the entire class. The operative phrase is "cross disciplinary."

### Rethinking the Basics

Of course, computer science classes play an important role in Computech's program. In their zeal to make computers the cornerstone of the curriculum, the school's planners initially took a heavy-handed approach to teaching computer science. They soon discovered that, although some of the 12- to 15-year-old students came to the school with considerable experience in graphics and even machine language, most did not have the mathematical knowledge necessary to handle variables, subroutines, and algorithms. Many could't type very well so that even simple data entry at the keyboard was frustrating.

The first computer science course has been revised to include more general

computer literacy and basic understanding of the machine, its history, and its practical uses. Word processing is taught both to demonstrate the computer's text-handling capabilities and to reinforce typing skills. At the same time, math teach-

**One sign of the school's success is that a majority of students attending are mentally gifted.**

ers are focusing on developing students' understanding of abstractions and the algebra skills they'll need for advanced programming.

The revised entry-level course will concentrate on computer literacy and Logo. BASIC is introduced in the second year, and the third and fourth years of required computer science courses will al-

low students to specialize in other languages such as Pascal, COBOL, and FORTRAN.

One sign of the school's success is its ability to attract bright students. A majority of the students attending Computech are mentally gifted or academically successful. In the fall of 1983, 1,600 students applied and only 600 could be accepted. Although the number of applicants fell in 1984 to 900 (450 were selected), the quality of those applicants was very high. The school's administrators say that the word has spread—Computech is tough, and only the serious need apply.

Students are chosen on the basis of achievement, grades, and teacher recommendations. Using *VisiPlot/Trend*, administrators identified a high correlation between success in mathematics and acceptance at Computech, but the students tend to be across-the-board achievers.

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## Pet Projects

Attracting capable and motivated students and then nurturing them in this academic greenhouse has produced some interesting results. One student, for the science fair, used a laser, a photocell, and an oscilloscope to measure the heartbeat of a spider. Another wrote a program that "taught" a robot to walk through a maze. Still another used a combination of BASIC and assembly language to write software to control the motors that operate the robotic arm he built; the program's motor control enables the arm to locate an object, grasp it, put it in a predetermined place, and then release it. Not satisfied to have the robotic arm merely fetch on demand, the student has since programmed it to grasp a pen and write his name.

The head of Computech's science department used to work for NASA and has a special interest in the space program.

One of his pet projects is guiding Computech students through the development and implementation of a science experiment that will ride aboard a future space shuttle flight.

A core group of Computech students

One student used a laser, a photocell, and an oscilloscope to measure the heartbeat of a spider.

went to California Polytechnic to confer with college students there who are doing a similar project. Computech's students have conducted research, and a student committee will soon choose an experiment to submit to NASA. This is part of NASA's "Getaway Special" program, and participating in it is quite expensive. Students will have to conduct fund-rais-

ers and seek corporate sponsors once their project is further defined.

## What About Desegregation?

Computech's success has all but overshadowed the goal that gave it life: to peacefully achieve a racial balance in a nearly all-black school. The ethnic distribution of students in the Computech program is Anglo, 56%; Hispanic, 23%; Black, 13%; Asian, 16%; Other, 2%. The school has no gangs and has fewer discipline problems than other schools. Everyone applied to get in; once admitted, few will risk being sent back to their neighborhood schools by causing trouble. They're too busy with more important things.

*Rebecca Moore Lyles is a technical writer for a software development company and has taught computer science to gifted children.*



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The new Eastman Kodak diskettes, for example, are one of these. So are IBM 5 1/4" diskettes. Same for DY-SAN, Polaroid and many, many other familiar diskette brand names. Each of these diskettes is manufactured in whole or in part by another company!

So, we decided to just like the big guys. That's how we would cut diskette prices—without lowering the quality.

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Instead, they concentrate their efforts on turning out the highest quality diskettes they can, because they sell them to the software publishers, computer manufacturers and other folks who (in turn) put their name on them...and sell them for much higher prices to you!

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The FDA bulletin board network (BBN), available by subscription through ITT Dialcom, Inc., has actually been on-line since 1983 but has only recently been supplemented by an information service supplied by the federal government that reports news from the White House (WHNEWS), U.S. Army Reserve (USRNEWS), U.S. Department of Agriculture (USDA), Federal Emergency Management Agency (FEMA), National Aeronautics and Space Administration (NASA), and Department of the Interior (INTERIOR).

ITT Dialcom is one of the most full-featured electronic data storehouses

around. As well as offering full electronic mail services, it ties into a wide variety of databases, such as that of the FDA network. However, it is also one of the more expensive on-line services. I estimate that—excluding subscription fees, which range anywhere from \$100 to \$2,500—it can run you as much as \$35 an hour to scour the FDA beat.

After signing on to ITT Dialcom and typing "FedNews" at the prompt, you will be presented with an unfurling American flag that makes it clear you have been electronically transported to the heart of the federal government. The rest of the selection process is routinely menu driven, with sufficient on-line help to let anyone get started quickly and efficiently scan the BBN's contents.

You can choose from such files as News Releases, Drug & Device Product

Approval List, Import Detention Lists, FDA Consumer Magazine Index, Index of News Releases and Answers, and Urgent Notifications.

## No Urgency?

The last menu item on the list is clearly the most intriguing. Urgent listings from the FDA are the kind of source any self-respecting PC physician would routinely access. The bulletin board is designed to draw your attention to vitally important reports such as Class I recalls—those products taken off the market for causing severe bodily harm.

Unfortunately, when I searched through the database list in mid-February, there were no urgent notices to speak of—either a reassuring statement about the health of America or a sign of laxness in the way BBN editors maintain and research this promising but incomplete information service.

The latter explanation seems likely,



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## MEDICINE

for the FDA BBN is staffed by three employees who simply type in the information on-line. The bulletin board should have an editor to keep the on-line reading matter varied and readable and to remove

out-of-date data. The News file, for instance, carried items that were at best several days old, and it contained no medical clippings from news services or other medical information sources.

### Drug Goodies

Nevertheless, enough other goodies are on the FDA line to make up for this shortcoming. The FDA's Enforcement Report (ENFORCE), detailing recent FDA actions, was of particular interest. One item, for example, reported that the Kroger Company recalled 7,000 bottles of Theophylline after discovering that some contained tablets of the wrong strength.

The FDA drug approvals file (AP-PROVAL) is a pertinent report on new products that have made it past FDA

The FDA magazine index organizes consumer magazine articles and excerpts that would be of particular interest to physicians.

scrutiny to drug counters everywhere. The BBN lists medications approved in the past 2 months, giving their approval date, trade name, manufacturer, strength, and active ingredients.

As in all on-line databases, each FDA BBN section offers read, scan, and search functions. Thus, it is possible to skim through the entire database in less than a ½ hour. You can also scan every file with a single keyword function. Unfortunately, this search function doesn't allow a universal search of all the files—something that would make regular trips to the FDA database relatively painless and inexpensive.

There are several BBN files in which you must expect to do some heavy reading, such as the FDA magazine index, which organizes a range of consumer magazine articles and excerpts that would be of particular interest to physicians.

### Tomorrow's News Today

You can also access a list of FDA news releases from the BBN. Releases I saw included "Aspirin Labeling and Reye's Syndrome," "Hair Growers Proved Ineffective," and "New Labeling Requirements for Acne Product." Most sci-

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ence desks at major newspapers subscribe to the FDA BBN in order to obtain these news flashes. Scanning the FDA BBN is a sure-fire way of reading tomorrow's headlines today.

Some files don't need to be constantly updated; the FDA Drug Bulletins are posted only three times a year. These "officially" notify physicians of a range of side effects and a wide variety of new pharmaceutical applications. For example, one recently reported that a drug (Pentamidine Isethionate) was approved to combat a type of pneumonia that results from AIDS.

This may not be the kind of information that will directly affect most general practices. If you're interested, however, these FDA sources are the fastest and most direct line to drug and health information in the United States. And they are nicely complemented by other ITT Dialcom news offerings—like the UPI and AP news wires and the International Medical Tribune Syndicate (IMTS)—that can be accessed by typing Dialcom's NEWS command.

#### Canned Answers

To complement the news release file, the ANSWERS file prints "canned" answers to questions that arise from current news stories. ANSWERS would be more effective if it were more interactive—if, for example, it allowed physicians to post their own medical/computing ques-

Scanning the FDA's  
bulletin board network  
is a sure-fire way of  
reading tomorrow's  
headlines today.

tions that would subsequently be answered by either an FDA expert or a fellow on-line.

Instead, the FDA uses ANSWERS to disseminate press information to its field force. In the event that a health story hits the front pages, FDA offices throughout the country will be barraged with questions from the press and the public. This file, which is open to inspection by any FDA BBN user, gives FDA officials the

"agency line" on the issue.

The FDA BBN is a good service and contains enough information to satisfy an alert physician. However, this service could benefit from better editing of the

information and a more interactive approach.

*Martin Porter is a contributing editor to PC Magazine.*

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# New on the Market

## HARDWARE

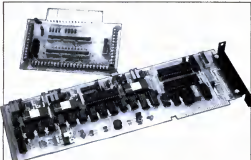
### ADALAB-PC Board

A data acquisition board with software drivers permitting the board to control a range of lab instruments. Features of the board include a 13-bit integrating A/D converter for slow voltage sampling, a 12-bit successive-approximation A/D converter for fast voltage sampling, and two 12-bit D/A converters for voltage output. Each built-in A/D and D/A converter includes multiple jumper-selectable voltage ranges.

The ADALAB-PC board's digital I/O capabilities include 24 directional bits, eight TTL-buffered output bits, and seven bidirectional handshaking

signals that can also be used for interrupts. A ribbon cable connects the board to an external card that provides a four-channel voltage input multiplexer, as well as screw-terminal connections for all analog and digital signals.

ADAPT software included with the board allows hardware-based functions to be accessed via simple CALL statements from BASIC, FORTRAN, or Pascal programs. Advanced features of the software include data storage and retrieval from extended RAM ranges (up to 640K), frequency counting, and scrolling stripchart display of data on the user's monitor. Also included in the software is a menu-driven data acquisition



ADALAB-PC Board, Interactive Microware, Inc.



Datalinx 224 Modem, Penril DataComm

tion program and a diagnostics routine.  
(List Price: \$895)  
Interactive Microware, Inc.  
P.O. Box 139  
State College, PA 16804  
(814) 238-8294

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### Datalinx 224 Modem

A standalone modem capable of data transfers at rates of up to 2,400 bits per second. The Datalinx 224 is compatible with the CCITT V.22 standard at 2,400 bps, and offers Bell 103 and 212A compatibility at 300 and 1,200 bps, respectively. Its autodial function can be accessed by the user through either the Penril command structure or the Hayes protocols.

The unit is equipped with an LCD screen for displaying self-diagnostic checkouts as well as for prompting the user for commands in concise English. Capable of synchronous or asynchro-

nous operations, the unit incorporates an automatic adaptive equalizer at 1,200 and 2,400 bps.

The Datalinx 224 is available in either a standalone or rack-mounted configuration.

(List Price: Standalone model, \$895; Rack-mounted board, \$865)  
Penril DataComm  
207 Perry Pkwy.  
Catheersburg, MD 20877  
(301) 921-8600

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READER SERVICE CARD

### DotMax 241

A dot matrix printer capable of emulating either the Epson FX-80 Printer or the IBM Graphics Printer. It can print graphics in two modes: an 8-bit image mode with 200- x 60-dots-per-inch resolution, or in a 24-bit image mode with 360- x 180-dpi resolution.

In addition to standard IBM Graphics Printer commands, the DotMax 241 in-

## New on the Market Submissions Guide

Owing to the high volume of new product materials received each week at PC, all submissions to New on the Market should follow these guidelines:

1. Include the retail price and details of both hardware and software needed for an end-user to properly use your new product. This includes required amount of RAM, number and type of drives, operating systems supported, and peripheral equipment needed.
2. Releases should be typewritten double-spaced on one side of the paper. Copies of advertisements may be included, but in most instances we need more information than is typically included in an ad. Include telephone contacts for marketing and technical questions.
3. If available, include black & white glossy photos of the product, 4 x 5 inches or larger.

New on the Market does not review products; do not send sample or demo copies of software. All product announcements are run on a space-available basis, at the exclusive discretion of the editor. Please note that it is impossible to guarantee publication of a product announcement for any particular issue.



## HARDWARE

cludes downloadable character fonts, cut-sheet feeder commands, and additional commands for such word processing functions as underlining or boldface text. Ten character sets are available, including scientific symbols and reduced-size sub- and superscripts.

Other features of the printer include print speeds of 240 characters per second in draft mode (80 cps in correspondence mode), dual serial and parallel interfaces, a 16½-inch carriage, and a range of form-feeding options.

(List Price: \$1,995)  
Fujitsu America, Inc.  
3055 Orchard Dr.  
San Jose, CA 95134  
(408) 946-8777

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READER SERVICE CARD

### Philips CoSystem

An integrated voice and data terminal that is linked together with a PC within a network setup. The telephone-like device incorporates 92K RAM, a 1,200-bps modem, and a speakerphone. It permits the user to transmit data files between computers and handle electronic mail, while also providing such telephone functions as a 400-name



Philips CoSystem,  
Philips Information Systems

database and time management system. CoSystem uses standard telephone lines and is compatible with existing PBX systems.

(List Price: \$2,295)  
Philips Information Systems  
15301 Dallas Pkwy. #300  
Dallas, TX 75248  
(214) 980-2000

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### Sunflower Subsystems

A series of standalone Winchester drives incorporating a fixed hard disk in formatted storage capacities from 10 to 30 megabytes with a removable cartridge of 5 or 10 megabyte capacity. The Sunflower units offer average access times of from 95 to 99 milliseconds on the fixed drives (90 msec on the cartridge) and data transfer rates of 5 megabytes per second.

(List Price: \$2,995-\$4,595,  
depending upon model)  
Kustom Electronics Inc.  
8320 Nieman Rd.  
Lenexa, KS 66214  
(800) 255-6311  
(913) 492-1400  
Telex: 43-7437

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### Brother HR-10 Printer

A low-cost daisywheel printer designed for home use. Available with either a Centronics parallel or RS-232 serial interface, the Brother HR-10 weighs a scant 11 pounds and provides such print features as shadow printing, super- and subscripts, and automatic underlining.

The printer uses the same



Dottie, Dottie Div., VentuResearch

print wheels and ribbon cartridges as other Brother printers and typewriters; it includes a 2K RAM buffer and tractor feed mechanism. (List Price: \$349)  
Brother International Corp.  
8 Corporate Pl.  
Piscataway, NJ 08854  
(201) 981-0300

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READER SERVICE CARD

### Dottie

A PC-programmable moving sign/bulletin board that can serve to call attention to a display. Dottie signs are available in three models—A, B, and C—and can be programmed either with the included detachable keypad (for short, one-time messages) or with a PC (for long messages stored on disk). Each Dottie model includes

a rechargeable internal battery to back up its memory. Models B and C also provide an internal real-time clock.

Using the Sign Writer A BASIC software, available separately, the signs can be programmed to produce steady or continuously scrolling messages, with or without blinking characters. Messages can be stored on disk for reuse and transferred to the Dottie unit via a standard RS-232 serial port. (List Price: Dottie Model A, \$495; Model B, \$625; Model C, \$795. Sign Writer A software, \$25)

Dottie Div., VentuResearch  
2813 N. Yarborough Dr.  
El Paso, TX 79925  
(915) 594-4094  
Telex: 75-6947

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READER SERVICE CARD

# SLEUTH

An on-line security device for use with a Hayes Smartmodem. Placed in-line between the user's system and the Hayes Smartmodem, SLEUTH intercepts all incoming calls and requests an authorized password. It then disconnects the phone connection, verifies the caller's ID, and calls the party back using a preprogrammed phone number.

Accompanying menu-driven software that stores up to 74 names, passwords, and phone numbers on a nonvolatile EAROM chip simplifies the entry of authorized users. All data stored is retained in the event of a power failure.

(List Price: \$465)  
 Scotland Yard Computer Security Products  
 8533 W. Sunset Blvd., #106  
 Los Angeles, CA 90069  
 (213) 854-3536

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 READER SERVICE CARD

## SOFTWARE

### DosHistory Editor

A user interface for PC-DOS, providing DOS with such standard word processing features as character insert, delete, and full-screen cursor movement. *DosHistory Editor* also adds ten functions for command recall, allowing the user to edit or re-execute commands.

Users can redefine all keys in a simple initial setup routine, speeding the development of DOS files. *DosHistory Editor* saves up to 1,000 lines of screen

output, allowing reverse scrolling.

(List Price: \$45)  
**Requires:** 64K RAM, one disk drive, PC-DOS 2.x.  
*Lightning Software*  
 491 Jacaranda Way  
 Sunnyvale, CA 94086  
 (408) 730-9369

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 READER SERVICE CARD

### PC-DeskMates

A memory-resident desk organizing program offered as "shareware" (i.e., the user may try the package before purchase). *PC-DeskMates* is menu-driven and includes an alarm clock, calculator, appointments calendar, notepad, phone book and dialer, printer configurator with typewriter mode, and access to DOS commands from within an applications program. When used with concurrent windowing systems such as *TopView*, *PC-DeskMates* can be set to respond as a non-memory resident application.

(List Price: \$12.50; suggested registration, \$25)  
**Requires:** 128K RAM, one disk drive, PC-DOS 2.0.  
*Alternate Decision Software, Inc.*  
 P.O. Box 307  
 Lancaster, NY 14086  
 (716) 684-2423

CIRCLE 660 ON  
 READER SERVICE CARD

### Manager's Planner

A user-supported program for preparing daily work plans from the user's appointments, other calendar-based events, and major priority tasks. Features include a convenient calendar win-



*TelePaint, LCS/Telegraphics*

dow, an automatic phone directory, and a simplified method for handling the entry of repeat events on the user's schedule.

Other features of *Manager's Planner* include quick startup without installation, flexible free-form movement through the software's options, and intelligent interpretation of the user's shorthand notes.

A free copy of *Manager's Planner* may be obtained by sending a formatted, double-sided 5¼-inch disk with return label, mailer, and postage.

(Suggested Contribution: \$35)

**Requires:** 128K RAM, one disk drive, PC-DOS.  
*Nazetta Software*  
 5612 Granby Rd.  
 Rockville, MD 20855

CIRCLE 659 ON  
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### TelePaint

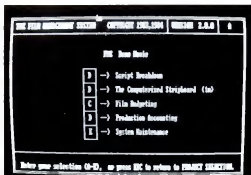
A mouse-driven graphics program with a user interface similar to Apple's *MacPaint* software. *TelePaint* allows the user to merge text and color graphics on a single 8½ × 11-inch sheet, including graphics created by other software such as Lotus's *1-2-3*.

The program's user interface features pull-down menus and pop-up windows. It is compatible with digital mice from Summagraphics, Microsoft, and Mouse Systems.

(List Price: \$149)  
**Requires:** 192K RAM, one disk drive, PC-DOS, digital mouse.

*LCS/Telegraphics*  
 261 Vassar St.  
 Cambridge, MA 02139  
 (617) 547-4738

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Remarkable Film & Video System, Heritage Systems Inc.

### Remarkable Film & Video System

A collection of integrated programs specifically designed to meet the needs of producers, directors, and other media professionals. The *Remarkable Film & Video System (RFVS)* includes programs for the IBM PC-XT in four areas of film production and planning: *Script Breakdown*, *Stripboard Scheduling*, *Budgeting*, and *Production Accounting*. The programs are available separately or as an integrated package, on an unlimited or single-show license basis.

The *RFVS Script Breakdown* software analyzes and evaluates scripts, permitting the user to isolate essential information about each scene or group of scenes forming a breakdown page. Two kinds of data are isolated: basic scene information (scene number, set name, one-line action description, INT/EXT, lighting, script pages) and scene specifics,

including characters, wardrobe, props, SPFX, and other details. A global change feature permits rapid handling of script changes for any number of scenes, characters, or sets.

*RFVS Scheduling* organizes the data provided by the *Script Breakdown* component to develop an efficient shooting schedule, a day-out-of-days chart, and a full-color stripboard printout that can be mounted on a standard production board. Here again, changes made

during a production can be readily effected, with automatic regeneration of affected reports.

The *Budgeting* components of *RFVS* take into account all the cost factors identified by the user in the previous programs to produce forecasts of costs for cast, crew, set design/construction, set dressing, and transportation. Custom spreadsheet formats prompt for data under all production categories, including labor rates, rentals, and fares. Budget revisions can be made at any time, with automatic recalculations of all affected budget accounts.

The *Budgeting* component produces a standard Film Budget listing with top sheet, plus detailed workups of transportation, set construction, and other special categories. A listing of headings and budget codes can also be produced.

The *Production Accounting* module of *RFVS* provides general ledger, estimates-to-completion, disbursements, commit-

ments, and labor-costing facilities. All transactions are kept current throughout the life of a production, with detailed reports available from the system as needed.

(List Price: Complete system on an unlimited license, \$9,800; single-show license, \$4,900. Individual programs: Script Breakdown, \$1,450; Scheduling, \$1,950; Budgeting, \$2,950; Production Accounting, \$3,450)

**Requires:** 256K, 10 MB hard disk, PC-DOS 2.x. *Heritage Systems Inc.* 10011 N. Foothill Blvd. Cupertino, CA 95014 (408) 996-9898

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### QuizRite

A test preparation program permitting teachers to create tests easily, mixing multiple-choice, True/False, matching, and completion questions using a single data file. Questions to be included on a test can be selected manually or automatically.

Tests prepared with *QuizRite* can be printed as is or specially formatted to allow the use of a separate machine-graded answer key. Each test generated by the program also produces an answer key.

(List Price: \$89)

**Requires:** 128K RAM, one disk drive, PC-DOS 2.1. *Class 1 Systems* 17909 Maple St. Lansing, IL 60438 (312) 474-4664

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QuizRite, Class 1 Systems

## SOFTWARE



STATA, Computer Resource Center

### STATA

An interactive statistics and data analysis program providing all the standard univariate statistical functions, correlations, and covariances; one-, two-, and *n*-way tables; and chi-square tests for independence in two-way tables.

STATA estimates multivariate regression and ANOVA models with an unlimited number of observations using ordinary least squares, instrument variables, or two-stage least squares. It also performs tests of linear hypotheses on these models. Data management facilities provided by STATA include the ability to sort, append, and merge data sets.

The program can read several types of data formats, as well as format data for other applications uses.

(List Price: \$395)

**Requires:** 256K RAM, two disk drives, PC-DOS 2.x.  
Computer Resource Center  
10801 National Blvd.  
Los Angeles, CA 90064  
(213) 470-4341

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### CrossWord

A text file conversion and transfer package allowing users to transfer word processing files between an IBM PC and a VAX mini-computer from Digital Equipment Corp.

The CrossWord package contains software for both the IBM and DEC systems, allowing PC files to be worked on by the DEC WORD-11 word processing system. In addition, files can be transferred between IBM PCs, using the DEC VAX system for file storage.

Initial PC word processing systems supported included WordStar and Multimate, with support for both PC-DOS and DEC's VAX/VMS operating systems. Can also transfer files between WordStar and Multimate in one PC.

(List Price: VAX/PC package, \$1,300; additional PC software, \$200)

**Requires:** PC: 128K RAM, one disk drive, PC-DOS, async card, WordStar or Multimate. VAX: 600 pgs. RAM, 1000 disk blocks, VMS 3.5.

Data Processing Design, Inc.  
1400 N. Brasher  
Anaheim, CA 92807  
(714) 970-1515

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Over 400 pages of documentation accompany the library, describing methodology, source code, test programs, and expected test results.

(List Price: \$175)

**Requires:** 192K RAM, two 320K drives, PC-DOS, Latice C Compiler, Version 2.12 or later.

Wiley Professional Software  
605 Third Ave.  
New York, NY 10158  
(212) 850-6009  
(212) 850-6788

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C Language Scientific Subroutine Library, Wiley Professional Software

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## COMING UP



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### SNA Strategies

Linking a PC to a mainframe isn't as difficult as it seems—if the existing SNA infrastructure is utilized. *PC Tech Journal* introduces IBM's System Network Architecture (SNA) and offers four strategies for bridging the micro/mainframe gap as well as thoughts on combining micro/mainframe communications with local area networks.

### PGC and VX/PC

An in-depth review of two sophisticated products for graphics professionals: IBM's Professional Graphics Controller and the VX/PC from Vectrix.

### COBOL

In continuing coverage of the migration of COBOL to the PC, *PC Tech Journal* will review compilers from Microsoft, Micro Focus, and Digital Research.

### Tools for C Programmers

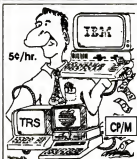
Window libraries allow C programmers to partition single applications with windows and update these windows independently. The second part of a three-part series, "Tools for C Programmers" compares six window libraries.

### PC/IX

IBM's single-user entry in the UNIX market, PC/IX, is put through its paces in *PC Tech Journal's* investigation of implementations for the IBM XT.

### Pocket APL

*PC Tech Journal* looks at *Pocket APL*, a new package from STSC, the makers of *APL-Plus*, which provides an inexpensive introduction to the APL language.



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# The Greatest Story on Earth: The Chip and Its Roots

The Chip and Three Degrees above Zero mix technical data with history to give you an overview of the greatest technological advances of this century, including the chip and the transistor.

One day in 1980, T.R. Reid, a *Washington Post* journalist, punched his computer terminal in a fit of pique, and the screen went blank. A technician explained that a small black rectangle resembling a plastic beetle with copper legs and residing deep in the guts of the computer caused the problem. He also said that this chip, one of several in a typical microcomputer, was the "heart of the whole thing." Reid decided to learn more, and the result is a new book, *The Chip: How Two Americans Invented the Microchip and Launched a Revolution*.

## Most Common Element

*The Chip* reads like a documentary. It presents the invention of the microchip, also known as a semiconductor or integrated circuit, as the solution to an electronic problem of wiring together the large numbers of transistors, resistors, and capacitors necessary for exotic communications or computer circuits. The

best material in which to imbue this myriad of connections turned out to be silicon, the most common element on earth. (For an illustrated history of the chip, see *PC*, Volume 3 Numbers 4-6.)

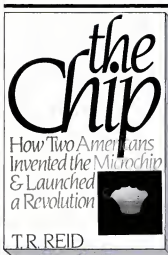
The book's subtitle gives away the fact

year struggle for the patent is fascinating. It pitted Kilby, a soft-spoken introverted inventor, against Noyce, a dynamic risk taker who is still visible in the micro industry today. After a long series of appeals, the case eventually came before the Supreme Court. Although the Court decided in favor of Noyce, Texas Instruments and Fairchild arrived at an agreement that was mutually acceptable. Within the scientific community, Kilby and Noyce are acknowledged as co-inventors of the silicon microchip.

## Good Analogies

*The Chip* is a well-written and colorful book. Reid takes care to place his narrative in the proper historical context. He also liberally sprinkles the technical material with examples that help you understand even the most abstruse concepts. Here is a typical analogy from the book: "semiconductor diffusion works like a barbecue pit where hickory smoke seeps into the meat and imparts a distinctive flavor." At the same time, Reid doesn't ignore important business concerns. From the text, you learn that there is no replacement market for the chip because it simply doesn't wear out. To ensure that there would be an expanding market, he says, the personal computer virtually had the world. By 1981, before the divestiture, the Labs had about 24,000 employees in several locations, of whom almost one-quarter had Ph.D.'s.

Finally, Reid includes an excellent bibliography for those who are interested in obtaining additional information on the microchip.



that two men were credited with the invention of the chip: Jack S. Kilby, then of Texas Instruments, and Robert Noyce, who is one of the founders of Fairchild Semiconductor and is now chairman of Intel. What makes this invention story interesting, even suspenseful, is that Kilby and Noyce worked independently of each other.

*The Chip's* account of the ensuing 10-

**PC FUTURE**  
*The Chip: How Two Americans Invented the Microchip and Launched a Revolution*

T.R. Reid  
Simon & Schuster, Inc.  
1230 Ave. of the Americas  
New York, NY 10020  
(212) 245-6400  
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## BOOK REVIEW

### Bell Labs Discoveries

Unlike *The Chip*, Jeremy Bernstein's *Three Degrees above Zero: Bell Labs in the Information Age* is not exclusively related to one or more specific inventions. Instead, it mainly focuses on the Bell Laboratories scientists behind some of the greatest technological advances of this century. The book gives you a sense of the almost gentle climate in which great minds seem to thrive.

The story that inspired the title of *Three Degrees above Zero* begins 12 to 15 billion years ago, when a cosmic explosion occurred that some believe resulted in the birth of the universe. This explosion—the Big Bang—released very low-energy photons called light quanta. Today, about 400 of these "fossil" photons float in every cubic centimeter of the universe. With the right antenna and amplifier, the hissing of these remnants can be heard by the human ear.

This discovery brought the 1978 Nobel Prize in physics to Arno A. Penzias and Robert W. Wilson, two radio astronomers at New Jersey's Bell Lab. Wilson and Penzias, who is currently

By 1981, before the divestiture, the Labs had about 24,000 employees in several locations, of whom almost one-quarter had Ph.D.'s.

vice president in charge of research, are two of the scientists whom Bernstein profiles. Through their work, Penzias and Wilson determined that the universe has now stabilized to an average temperature of 3 degrees above absolute zero, hence the book's name.

### A Venerable Institution

The research and development facility of AT&T's Bell Labs is currently adjusting to the federally ordered divestiture of its parent company, but it is a venerable institution with a long history. In *Three Degrees above Zero*, Bernstein looks back almost 100 years and describes how the American Bell Company initially established the skeletal technical departments to lengthen telephone routes and improve transmission quality. From these early roots in telephony, Bell Labs has grown into one of the most respected sites of both basic and applied research in the world. By 1981, before the divestiture, the Labs had about 24,000 employees in several locations, of whom almost one-quarter had Ph.D.'s.

### Some Omissions

Not surprisingly, out of Bell Labs came one of the most important developments of



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PC MAGAZINE • JULY 9, 1985

modern science—the transistor, for which the team of William B. Shockley, Walter Brattain, and John Bardeen won the Nobel Prize in physics in 1956. Curiously, however, even though Bernstein traces the 1958 conception of the integrated circuit by Jack Kilby of Texas Instruments back to work done 4 years earlier at Bell Labs, he does not mention Robert Noyce's contribution. Nor does *The Chip* allude to work done at Bell Labs.

#### A Nonintervention Policy

It is their freedom to pursue wide-ranging scientific interests that sets Bell researchers apart. And, evidently, much good has come from it. The Hungarian scientist, Bela Julesz, for example, came to Bell Labs to work in the area of television engineering but instead ended up doing extensive research in binocular vision. For Julesz, Bell's policy of nonintervention with its researchers allowed him eventually to create a device to test for "lazy eye" in children.

#### Supercomputer Chess Champ

Although most of the narrative has serious overtones, *Three Degrees above Zero* has its lighthearted moments, too. For example, Bell Labs owns a 133-pound chess machine that was a champion until it was defeated in 1983 by a Cray supercomputer. Another interesting facet of Bell's operation is its outdoor facility at Chester, New Jersey, that conducts simulated nature-like conditions, such as a windy hillside, to test much of its tele-

*Terry Nasta is a technical writer for Informatics, a large software development company in New York City.*

#### PC MAGAZINE

*Three Degrees above Zero:*  
Bell Labs in the Information Age  
Jeremy Bernstein  
Charles Scribner's Sons  
866 Third Ave.  
New York, NY 10022  
(609) 461-6500  
Copyright: 1984  
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*Three Degrees above Zero* is an informative and entertaining book. Bernstein does an admirable job of presenting some difficult material and conveying an in-

sight into the people at Bell Labs and how they work together to further science. It's unfortunate that AT&T's reorganization hangs so heavily over its future. ■

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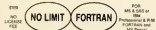
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# Coming Up



## Inside the Well-Designed Office

When you design the space in which your employees spend their days, do you take into account factors such as chair and desk height, lighting, and the number of workers per square foot? Some say that ergonomically designed workspaces promote increased worker productivity. *PC Magazine* gives you a look at several well-designed offices around the country and talks about what makes them work.

## The Macintosh Versus the PC

Is the Macintosh a serious contender or a cute pretender to the throne? *PC Magazine* pits the Apple Macintosh against the IBM PC in the arena that counts most—the demanding world of business applications. We analyze the results of benchmark tests in file loading and saving, search and replace, and data processing speed. The reviewers assess business software for the two machines, telling you how each works and where they differ.

## Multifunction Boards for the AT

IBM's AT stretches previous microcomputer random access memory capability, extending the boundaries into the megabyte range. Winn L. Rosch looks at new AT multifunction boards from AST, Cigma Info Systems, STB, and Tecmar and raises the question: How many megabytes of memory do you really need?

## The Price Waterhouse Report

Price Waterhouse takes a look at a minicomputer accounting package recently adapted for the PC: Macola's Financial Software.

## 2400-Baud Modems

M. David Stone and Alfred Glossbrenner review some of the new 2400-baud modems and discuss their possible effect on the telecommunications market.

## Two New Portables

*PC Magazine* reviews two new entries into the laptop race: the Data Vue 25 and the Visual Commuter II.

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